The Gas Salesman and Gas Service.

VOL. 5, NO. 59.]

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APPOINTMENTS & PROMOTIONS.

Gas Salesmen, Showroom Attendants, and Manufacturers' Representatives are invited to send information as to promotion or changes in appointment for publication under this heading.

NOTICES.

"The GAS SALESMAN" is published eighteen times a year; and the following are the Prices :

Annual Subscription 6s., post free, payable in advance.

Single copies (by post) 4½d.

Purchase in Bulk for Distribution among Gas Service Staffs—

100	copies of each issue,	30s,	plus carriage
50	" "	16s.	"
25	" "	8s.	"
12	" "	4s.	"

From October to the end of March, "The Gas Salesman" is published twice a month; from April to September, on the last Wednesday in each month.

The Editor reserves to himself the right to delete from, or modify any, communications submitted—particularly those dealing with matters of a purely personal nature.

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EDITORIAL.

Industrial Salesmen.

THE meeting of the Industrial Salesmen's Circle in Glasgow on Wednesday of last week was one of the most successful yet held by the members; and for this thanks are greatly due, for their hearty and sympathetic co-operation, to the Glasgow Corporation Gas Department and the Engineer and General Manager (Mr. J. W. McLusky). The whole atmosphere of the meeting was one of serious inquiry and practical co-operation, which must be highly fruitful to the gas industry.

Regarding the paper which Mr. John McIsaac read, on the "Application of Town Gas for Industrial Heating," it was one of those productions the value of which lies not only in its usefulness for immediate study, but in its availability for reference in the time to come, inasmuch as in it there are data—from actual work, and not test-running—relating to a selected number of gas-heating processes which are in successful operation in the Glasgow gas-supply area. The examples comprise both large and small processes. A concise statement is given by the author regarding each operation; and the data include running costs and, where available, comparative figures. Some of the processes the members were privileged to see at work through the courtesy of the owners of the factories; and the demonstration was impressive, particularly as the visitors were in possession of the cost of output figures supplied in Mr. McIsaac's paper.

The detailed data will be very serviceable to salesmen in other districts who desire to develop any of the processes. Capacities of apparatus, consumptions, pressures, outputs, costs per unit of work, and so forth are all given; and can therefore be used as a basis to ascertain what would happen in other local circumstances. The one thing missing to enable precise calculation to be made is the calorific power of the gas—the declared is 470 B.Th.U.; and we believe the supplied is 480 B.Th.U. If this is wrong, perhaps Mr. McIsaac will put us right. In connection with biscuit and tea cake baking, the moderate cost and large output, using gas with a conveyor oven, is remarkable. For rivet heating in shipbuilding work, gas is shown to give superior output for equal cost in fuel and power, compared with oil or coke fired furnaces. In calendar heating for making corrugated paper packing sheets, gas is found to be 46 p.ct. cheaper than electricity, while the output is increased 66 p.ct. In newspaper stereo work, gas comes out on top, as compared with oil heating, in point of cost under the conditions defined in the paper.

The brevity of this editorial reference is due to the report of the proceedings not reaching us in time to permit of a more extended investigation of them. The report, however, is published in this issue, and tells a tale of a full and highly profitable conference.

Maximum Use of Showrooms.

NOT long ago, attention was directed to the many thousands of pounds the Gas Light and Coke Company are expending in buying ground, building showrooms, and equipping them in modern style. This the Governor (Mr. D. Milne Watson, D.L.) told the proprietors, at their annual meeting, was good expenditure, and nothing would deter the Board from proceeding with it until every district had a gas showroom worthy of the great undertaking and of the industry. Every gas undertaking should have prominent representation of the same kind. It has something to sell, something to which to draw attention, something which yields honest service for money spent. Since then the Company have opened their palatial showrooms at Horseferry Road, where everything is shown suitable for the use of any building or dwelling-house in the West-end of London. Good use is being made of these showrooms. They are not there for the casual visitor only, but for set visits upon invitation or desire. They have already been an eye-opener to many professional men, who had no idea that gas offered such a range of service, and of appliances and settings fit for Buckingham Palace down to the humblest abode. Architects have said that, until they saw what had been done in these showrooms, they were not aware of the actual extent and variety of accomplishments and suitability of gas. Unless architects know of these things, they cannot design

with the best effect for the accommodation of modern labour-saving equipment. They have to be shown that the old tradition that every room must have its fireplace and every kitchen its coal range is something which belongs to the Victorian days and not to those of George V. It is all very well to have printed statements as to the doings of gas-consuming appliances; it is another thing to have ocular demonstration. "Seeing is believing;" and seeing carries with it an impression which is not to be obtained in any other way.

On two days recently, during the Building Exhibition at Olympia, the Company invited representatives of the building trades to luncheon at Horseferry Road, and had acceptances totalling 150 each day. This luncheon was followed by an inspection of the equipment in the showrooms; and afterwards the visitors proceeded to Olympia to inspect the Company's exhibit there. This event leads us to ask the question whether all gas undertakings have made a study of how to get the maximum educational value out of their showrooms. There are the showrooms; are they yielding, not only direct money, but maximum effect, which is of advantage to the well-being and progress of the undertaking? Every business must spend money on advertising; but there is no business which can gain more than gas from its primary commodity by making people fully acquainted with the methods of obtaining from it the maximum result by proper application. Efficiency and economy go hand in hand; the advertising value of efficiency and economy cannot be calculated by any gas undertaking in terms of £ *s. d.* Chairmen and directors or committee men could make greater use of their gas showrooms by inviting, at different times, the local medical men, architects, builders, local technical and other organizations, students, and so forth, to come, see, and hear; and the making of a little function of the occasion would add to the interest and the recollection. Further, gas consumers ought to be encouraged to regard the local showrooms as places where they may seek advice and explanations in regard to any matter relating to the use of gas, without being expected to indulge in a new purchase or make provision for a new connection. Without seeking fresh business from such visitors, it will for a certainty influence it. The subject of the development of the service of showrooms is one which is worth exploration; and we are confident the exercise will result in promoting action.

During the visit of the representatives of the building industries to Horseferry Road, the Governor showed how (despite the improved efficiency with which gas is now used, and the enormous expansion of the electricity industry), the consumption of gas in the United Kingdom has increased since 1903 by no less than 84 p.ct.—from 160,000 million c.ft. to 295,000 millions. As a matter of fact, the last three or four years have witnessed the greatest expansion in the history of the industry, and every year now sees a larger increase than the previous one in the demand for gas appliances. In the Company's district, the number of gas appliances has increased to a very remarkable extent—by no less than 1,400,000 in the 23 years, or 400 p.ct. The sale of gas in the Company's present area in 1925 equalled 44,000 million c.ft., or 220,000,000 therms—nearly 25 p.ct. increase since 1921. The number of the Company's consumers, including His Majesty the King, is 1,136,000, of whom 664,000 buy gas through prepayment meters, paying about 600,000,000 pennies (some 5000 tons) into the meters annually, or nearly 2,000,000 pennies every day. These are interesting and useful particulars for a gas salesman to have by him in his work. The Governor also mentioned that comprehensive, thorough, and prolonged tests, on practical everyday working lines, have recently been completed by a Special Committee for the purpose of determining, with the most modern appliances, used in the most favourable conditions so far as electricity is concerned, the relative costs of cooking for a family by gas and by electricity. The tests have proved conclusively that, for equal service, cooking by electricity at 1d. per unit costs three times as much as cooking by gas at 8d. per therm, and that there is no greater loss of weight in the meat cooked by gas than in that equally well cooked by electricity. Mr. Milne Watson says this is one of the reasons (there are also others) why the Company are continually installing gas cookers in place of electric cookers which have been tried, and have been found wanting. However, the point we particularly wish to emphasize is that the more the service of showrooms is developed—their field of use is large—the more influential they will become in the interests of an undertaking.

Geyser Competition.

THE Geyser Competition has proved most popular among gas salesmen. Up to the time of the closing of the competition last Friday night, we had received 61 contributions. The heavy work of adjudication has already been commenced by the three Judges—Mr. Horace Baldry, Distribution Superintendent, South Suburban Gas Company; Mr. Samuel B. Chandler, A.M.I.Mech.E., Tottenham District Light, Heat, and Power Company; and Mr. H. H. Creasey, Manager of the Special Service Department of the Gas Light and Coke Company. They will naturally have to expend a considerable amount of time in the work; but that will be a pleasure, as they all have the interests of the industry well at heart. Each Judge is reading through the whole of the essays independently, and making his own notes and selections. When this part of the work is completed, they will meet together for the purpose of making their final determinations. In view of the amount of work which has to be done, contributors will, of course, have to exercise a little patience before learning the result. As soon as the decision of the Judges is available, an announcement will be made in the succeeding issue of "THE GAS SALESMAN," and the awards will be posted to the successful contributors. As we mentioned before, it is through the kindness of Messrs. Ewart & Son, Ltd., that this competition was made possible.

Jottings.

Those whose work lies on the district have all manner of difficulties to face. On some occasions they have to meet and pacify angry consumers; but it is not often that they have to pacify wild animals. In an article by Mr. G. L. Jennings, who was formerly Deputy Chief Inspector to the Brentford Gas Company, which is published in this issue of the "SALESMAN," he gives an account of an encounter with a Madagascar wild cat. We sincerely hope that this type of adventure is uncommon; otherwise a further qualification required of a salesman will be a thorough knowledge of the habits of animals, and methods for their capture or entertainment.

* * *

A most valuable paper was read by Mr. John McIsaac, of Glasgow, at the Industrial Salesmen's Conference on April 28. In this he gives a large amount of extremely useful data relating to a number of heating processes which are in successful operation in the Glasgow gas supply area. First of all he deals with biscuit and tea-cake baking in gas-fired ovens. The cost of gas, at 5d. per therm, works out at 0·11d. per lb. of biscuits, and 0·3d. per 11-oz. cake. The author goes on to consider rivet heating by oil, coke, and gas, and shows that with gas the increase in output over coke is 47·5 p.ct., and over oil 61 p.ct. With gas at 6·5d. per therm, coke at 32s. per ton, and oil at 4d. per gallon, gas costs 29·43 p.ct. less than coke, and 64·52 p.ct. less than oil.

* * *

The next comparison is between gas and electricity for making corrugated paper packing sheets. With the same machine, the output when gas is employed is 66·6 p.ct. greater than when electricity is used as the heating agent. With gas at 8·09d. per therm, and electricity at 2¼d. per unit, gas is cheaper by no less than 49 p.ct. Interesting figures are given for a gas-fired wood stoving chamber; the cost of stoving per sq. ft. of wood being 0·116d. when the price of gas is 3s. 2d. per 1000 c.ft. Finally, a comparison is given of gas and oil (on the dual system) used for heating a 7-ton stereo pot. The production of newspapers is an industry which must work to a time-table without fail; and to ensure prompt and certain results, gas has proved to be the most satisfactory and economical fuel available. In

the case of the 7-ton stereo pot, when gas is used instead of oil, the output is increased by 22 p.c. With gas at 5d. per therm, and oil at 5·5d. per gallon, there is a difference in cost in favour of gas of 21 p.ct. Mr. McIsaac's paper is excellent; all the necessary figures are quoted, there is absence of any "padding," and it is well considered. It deserves great praise, and should be taken as a model for similar papers.

* * *

Speaking at a meeting of the Illuminating Engineering Society on April 29, Dr. James Kerr, M.A., M.D. (late School Medical Officer for London), remarked that if large education authorities are to get full value for their money, and maintain efficiency in lighting, they will have to appoint men for this special duty as illumination inspectors. We would point out, however, that this difficulty is eliminated if gas is used and the gas undertaking has a maintenance system in force. Optimum artificial lighting for school-rooms, said Dr. Kerr, should be obtained by large light sources of an intrinsic brilliance up to 3 candles per sq. in., giving an evenly diffused lighting of about 5 foot-candles on each desk. Blackboards need accessory illumination of at least 60 p.ct. over the rest of the room.

* * *

The usefulness of gas continues to increase, and it may be of interest to our readers if mention is made of one or two of its unusual applications. For instance, growing orchid plants from seeds has been made possible by gas. Because of the rarity and beauty of this flower, its plants were formerly imported into America at great expense from their habitat in the tropics. Town gas now renders this unnecessary. The seed of the orchid is almost microscopic, and is incapable of self germination. Scientific methods must be applied, and the seeds are first placed in a glass flask containing a specially-prepared liquid which furnishes moisture and carbon dioxide. It is necessary to keep the temperature at 90° Fahr. in the daytime and at 70° during the night. At the end of the first year the plants are taken from the flasks and put into pots. Each year they are transferred, and at the end of five or six years they are ready to bloom. The fact that gas can be easily and efficiently controlled makes it invaluable in orchid culture, as any sudden change in temperature might cause the loss of years of work.

* * *

There are times when distribution men have to locate service pipes which were laid many years ago, and about which records have been lost—if, indeed, they were ever made. Tracing the path of these pipes is often a task which occupies a good deal of valuable time and necessitates considerable expense—that is, of course, if the trial and error system is adopted. A simple, inexpensive, and speedy method, employing the "wireless service locator," was demonstrated at Finchley on April 10, on the occasion of a visit of the London and Southern District Junior Gas Association to the works and new district stores of the North Middlesex Gas Company. A short account of the instrument and the system on which it is based will be found on p. 124 of this issue of the "SALESMAN."

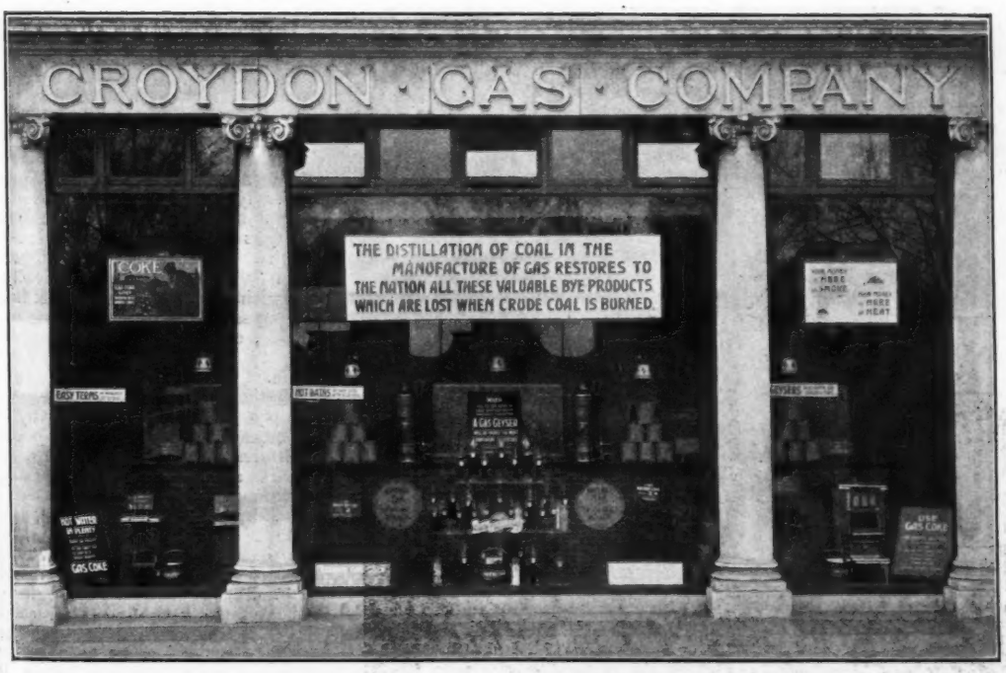
* * *

In a paper read before the Scottish Circle on April 21, Mr. A. B. Munroe, of Edinburgh, asks how many unsatisfactory gas fire installations are due to the architect or builder not knowing that it is necessary for a gas fire to be equipped with a proper flue, terminating over the roof of the house. If there is one part of a house where a flue is required, he says, surely it is the scullery. It is needed here for the removal not only of the products of combustion from the gas cooker or wash-boiler, but of steam, and the smell of cooked foodstuffs. It is also required for ensuring ventilation, to aid in the drying of clothes when the weather does not allow of outside airing. He asks how many modern houses have a flue connection in the bathroom, to allow of the fitting of a geyser.

* * *

Mr. Munroe gives an account of how he persuaded a type-metal founder to use gas instead of coal for melting his metal. Mr. Munroe prepared a three-section burner capable of passing 30 c.ft. when full on, and 20 c.ft. when working on by-pass. He also reduced the thickness of the bottom of the melting pot. The metal is melted in 55 minutes from a cold start, and when on by-pass is maintained in working condition. The cost with gas is equal to the cost with coal, but the wear on the furnace is less, and there is less waste in so far as varying temperatures—unavoidable when using coal—have a bad effect on the antimony used in the process of metal stamping. With gas, repairs are reduced, output is increased, and—what is very important—the night watchman can light-up the machine an hour before the workmen commence, with the result that there is no waiting when they arrive at their work. Already eight machines have been converted; and when the installation is complete the annual consumption will be fully 3 million c.ft. The texture of the type on the gas-fired furnace is more solid than that obtained from the coal-fired furnace. Being more solid, it is heavier; and since type is sold by weight, the advantages the manufacturer will gain will be readily understood. It is of interest to note that a deputation of the workmen have waited on the manufacturer, and expressed their desire for the conversion of their machines; so it is obvious that the advantages are not all with the employer.

Coke Display at Croydon.


CROYDON · GAS · COMPANY
THE DISTILLATION OF COAL IN THE MANUFACTURE OF GAS RESTORES TO THE NATION ALL THESE VALUABLE BYE PRODUCTS WHICH ARE LOST WHEN CRUDE COAL IS BURNED.
COKE
GAS COKE

INTERESTING THE CROYDON PUBLIC IN COKE.

A special coke display in one of the showroom windows of the Croydon Gas Company has attracted the attention of the public. The neat and effective dressing of the window is indicated in the photograph which we reproduce.

The "Glow-Worm Minor."

The growing demand for a smaller boiler has led to the development and production of the "Glow-Worm Minor," which is now on the market. Embodied in the design of this boiler are patented features which are claimed to be unique in cast-iron boilers, and which tend materially towards improved efficiency. For instance, the firebox, instead of being smooth, as is usually the case, is heavily ribbed. These ribs, being cast vertically, do not obstruct the downward feeding of the fuel; but, by making immediate contact with the incandescent coke, they attain a relatively high temperature, and consequently absorb and transmit more heat to the water inside the boiler than a plain heating surface could do. The makers state that scientific tests have proved this.

Another advantage of the vertical internal ribs (one which obviously results in the maximum heat being transmitted to the water) is that they form channels for the admission of air, so that the combustion of the fuel is most active next to the boiler heating surface.

In other respects the "Glow-Worm Minor" retains most of the well-known and desirable features which have distinguished the "Glow-Worm No. 1 and No. 2." All these boilers are of British manufacture, and are made by Messrs. O. Bruster & Richardson, No. 4, Lloyd's Avenue, E.C. 3.

TEST OF THE "GLOW-WORM MINOR."

The boiler was fixed in a permanent manner in a kitchen scullery, and the hot water cylinder was of 30-gallons capacity, with suitable pipe connections, and, therefore, represented an average domestic installation. The temperature of the cold water throughout the installation was 46° Fahr. The fire was lighted at 10.30 a.m. with coke and wood. In forty minutes the flow temperature had reached 158° Fahr., and six gallons of hot water at an average temperature of 146° Fahr. were drawn off. During the period of one hour after this, at ten-minute intervals, six gallons of water at an average temperature of 150° Fahr. were drawn off. The maximum temperature of the flow pipe during this period was 170° Fahr.

During the next fifty minutes, 42 gallons of water at an average temperature of 150° were drawn off; the coke consumption being approximately 7 lbs. per hour. This result indicates the claim that the special construction of the firebox of this boiler ensures very rapid and steady heat transmission from the glowing incandescent fire to the water.

The vertical ribs inside the firebox tend to keep the coke from actual contact with the side of the boiler, and allow preheated air to pass up on the outside of the fuel, ensuring perfect combustion where it is usually most difficult to obtain it (*i.e.*, in contact with the cold surface of the boiler). The heating surface of the boiler is computed 2¼ sq. ft.

Popularizing Gas-Fires with Architects.

It is at least further evidence of the spirit of co-operation that permeates the gas industry that so many undertakings have given their help to the Nautilus Fire Company in their efforts to promote increased interest in gas-heating among architects and the building interests generally, by means of Nautilus "Economy" gas flues. That help has taken, for the most part, the form of following up—by means of personal letters from the engineers or calls from members of the selling staff—the several hundreds of inquiries, from architects and others, resulting from the Nautilus Fire Company's recent propaganda. Many gas undertakings, moreover, have installed, and have invited local architects and builders to inspect, complete sections of the Nautilus gas flues in their showrooms.

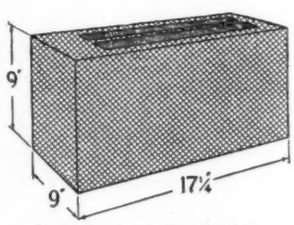
Further, the surprisingly large number of inquiries indicates a greatly increased susceptibility to the advantages of these flues on the part of a profession notoriously difficult to impress by the usual methods of sales promotion. It is fair to mark, not only the enterprising spirit that prompted the conception of the scheme, but also the care and skill with which it was worked out. Not content with advertising the flue blocks in the Trade and Professional Press, the Nautilus Fire Company communicated with every architect and builder in the country—a formidable number!

The Nautilus Booklet "Doing Away with Chimney-Breasts," concise as it is, yet presents the case for gas flues with an exhaustiveness never before attempted. So useful and so popular did this publication prove that a large edition was consumed in less than two months, and a revised reprint has had to be issued.

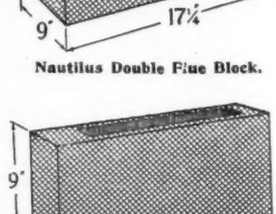
The interests of the Nautilus Company, associated as this firm is with the Davis Gas Stove Company, are not, of course, limited to the flue itself. Indeed, the sale of flue blocks is to them a matter of secondary consideration; the installation of gas fires being the main issue. And though practically every gas fire (except those of the inset type) can be used in conjunction with "Economy" flues, certain of the Davis patterns have been more especially designed for the purpose.

Among these are several varieties of a gas mantel register of cast iron, as well as various forms of inexpensive surround for use with the "N.H." built-in fire, specially designed and priced for housing purposes.

And then there are the "Rubston" gas fireplaces. It is expressly the re-introduction of these, with particular emphasis on their advantages in new buildings, that forms the next phase of the Nautilus propaganda to architects and builders in favour of gas heating. The "Rubston" series is specially calculated to appeal to all concerned—the architect, the builder, the owner, and the tenant. It differs from other types in that, in its characteristic form, there is no cast-iron framework to the gas fire. The material resembles red bricks, from which, indeed, a "Rubston" surround is practically indistinguishable to the lay eye. It is made by a process that ensures its being durable in colour, completely fire-resisting, and capable of being easily cleaned with a wet cloth.



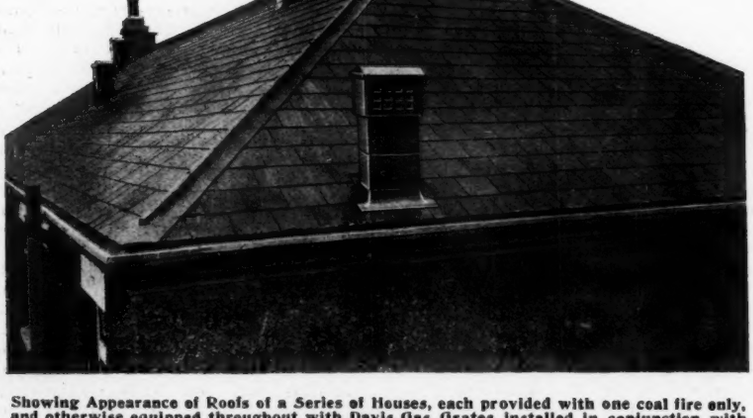
Nautilus Double Flue Block.



Nautilus Single Flue Block.

Neither for constructional reasons nor to comply with the building by-laws do "Rubston" fireplaces in any case need trimmers or concrete hearths, so that there is a saving in building costs, even if "Economy" flues are not used. Moreover, the price of a complete "Rubston" suite is considerably below that of a gas fire of equal size and efficiency with separate mantel, surround, hearth, and curb. And a "Rubston" fireplace is easy for the builder to fix—much easier, and therefore less costly, than a coal fireplace.

The ground having been prepared by means of the "Economy" flues, it is anticipated that the present efforts of the Nautilus Fire Company, Ltd., will evoke the lively interest of the architectural profession and the building trade in the "Rubston" fireplaces.


Showing Appearance of Roofs of a Series of Houses, each provided with one coal fire only, and otherwise equipped throughout with Davis Gas Grates installed in conjunction with Nautilus Economy Gas Flues.

Health Exhibition at Leicester.

Attractive Gas Exhibit.

In view of the importance of the Nation's Health Exhibition which is being held at the Junior Training Hall, Leicester, from May 12 to 22, the City of Leicester Gas Department have decided to interest the general public in the claims which gas as a modern illuminant and provider of economic and hygienic heating can so well substantiate.

The exhibition has very distinguished support, not only from local executive health committees, but from over fifty of the principal national health organizations, who are arranging exhibits, conferences, lectures, health films, health plays, tableaux, and other kindred matters as propaganda.

The Gas Department will be supported by most of the important gas apparatus manufacturers, including Messrs. Ewart & Sons, General Gas Appliances, Ltd., R. & A. Main, Ltd., the Parkinson Stove Company, Ltd., Radiation Ltd., Stoves Ltd., and William Sugg & Co., Ltd., all of whom are taking stands. These, with the addition of the Gas Department's own display, will naturally make the gas section of considerable interest and importance, not only as regards local interests, but to the gas industry as a whole.

Display of general apparatus is being left to the above-named makers. The stand of the Gas Department will therefore be arranged as a suite of rooms, comprising dining-room, lounge, and kitchen, with an office and information bureau; while at one end of the stand the British Commercial Gas Association will have their smoke abatement display. A very handsome stand is being erected by Messrs. Standcraft, Ltd., and the rooms will be artistically furnished for the occasion by local furnishers.

The dining-room is to be lighted by a centre superheated cluster burner beneath a large silk shade, and over the fireplace will be brackets with inverted burners and shades. The fireplace is to be fitted with a red brick "Rubston" gas grate by the Davis Gas Stove Company, Ltd. The central lighting fixture in the lounge will be similar to the above, but will be fitted with a hexagonal silk shade in oak frame. There will also be a Jacobean oak standard lamp with shade to match the pendant. The gas fire installed will be a Parkinson "Cosie" inset fire in art bronze, which is to be fitted into a recess with oak mantelpiece specially designed and made in the Department's workshops. The office will be lighted by a beautiful alabastria bowl fitting by Messrs. H. Jones & Son; the fireplace and oak surround being designed and made by the Department. The recess is to be fitted with a "Metro" log fire. In the kitchen recess will be an eye-level cooker, and alternative methods of providing hot water, by a gas circulator or a coke boiler, will be demonstrated. A gas heated wash copper and laundry iron will be shown, and also the "Eco-Dry" clothes dryer, and, of course, a gas fire with suitable tile surround. The "Electrolux" gas-heated refrigerator will also be exhibited.

Gas cookery demonstrations are to be given twice daily in the Empress Hall by Miss M. K. Gompertz, of the British Commercial Gas Association, under the auspices of the Institute of Hygiene. Lectures of interest are being arranged by Radiation, Ltd., and propaganda films will be shown daily.

The Gas Department have broadcast a large amount of literature calling attention to the gas exhibit, and a special showroom window display has been arranged for the occasion.

Some Experiences and Remarks.

By G. L. JENNINGS.

Distribution and sale of gas need people with knowledge. It must be remembered that members of the distribution staff of a gas company come in contact with large numbers of the public; and I propose to deal with some of my personal experiences with the Brentford Gas Company during the many years I served them.

It may be laid down as an axiom that tact and courtesy are as essential to a gas company's official as knowledge of his business. I have found that many of the rough places can be made smooth by exercising courtesy.

As an instance of this, I remember that shortly after the South African War, we received a sharply-worded letter from a consumer, lodging what appeared to be a serious complaint. I called at his house, and was shown into the drawing-room. The door was left slightly ajar by the maid, and shortly afterwards something came into the room. It was an animal I had not previously seen, dragging a chain attached to its collar. I endeavoured to keep the table between us, and while I was thus engaged, the lady of the house came in.

She said "Good morning," to which I replied, and then asked what was in the room with us.

"Oh, I am so sorry. It has broken loose again. It is a Madagascar wild cat."

The intruder having been dealt with, I stated the reason of my call.

"May I see my husband's letter?"

I produced it.

"Now," she said, "I will explain it to you. My husband came home last night somewhat earlier than usual, after what must have been a worrying day in the city, and he had to wait a short time for his dinner. I told him that it was being cooked as fast as the gas cooker could do it, but that he was a little early. This evidently put into his mind the idea of writing to the gas company. He will be home at seven to-night. Please come and see him then. Perhaps he can tell you what is the trouble. I certainly know of no cause for complaint."

I saw him at seven o'clock that night, and found that, far from wishing to make any complaint, he was only too anxious to withdraw the whole thing.

The situation was improved to the extent of taking an order for two gas fires—a happy issue of an unpleasant incident. This, to my mind, however, is typical of many complaints received by a gas company, and which can be easily settled.

Frequently a consumer is found who has—or feels that he has—grounds for complaint; and after the visit of an inspector, he should be left with the grievance removed or, at any rate, the inspector should be in full possession of the necessary particulars to allow of its early rectification. It is essential that the consumer should be left with friendly feelings toward the company, otherwise the inspector has failed in his work.

I remember once addressing a ratepayers' association in a certain district in Surrey. The Chairman of the local Council presided. Following a discussion, he proposed a vote of thanks. He said: "I had always pictured a gas company as a large soulless concern; but the speaker has endowed with a personality the Gas Company he represents."

This happily-expressed phrase is what everyone who represents a gas company should aim at. It lies with him to see that the personality he presents to the consumer is an agreeable and pleasing one. He must remember that, as he is probably the only representative of the company the public will see, to them he is symbolical of the whole of the company. Again, he should bear in mind that, while the consumer is entitled to the utmost attention, the company is entitled to his best services. The company's interests must be uppermost in his mind; and he should not give way on any point by which it would be adversely affected.

When he is after new business, courteous perseverance is essential. I remember a case where one of the Company's canvassers had been trying to induce the proprietor of a large drapery business to light his premises with gas. I was passing, and saw the canvasser come out. He told me that he had seen the trader three or four times, and was hopeful of getting the business, but unfortunately had just made a remark that had caused friction. I went into the shop at once, and expressed regret; and I finally left with a contract in my pocket signed for the relighting of the whole premises.

Wherever possible, the same official should carry the business right through; but where he finds that he is making no headway, one of his superiors should take the matter up, if it is one in which there is any prospect of a successful issue.

I do not agree with the practice of limiting the scope of a gas company's local representative. If he is not capable of dealing with all the consumers upon a district, including the local surveyor, clerk to the council, &c., he is not suitable for his job, and should be displaced. In my opinion, the limitation should come in the *size* of the job that he should be allowed to undertake, rather than in the persons with whom he should be allowed to deal. I am aware that some companies do not allow local representatives to deal with factories, hospitals, doctors, surveyors, &c.; but in my opinion this is an error. The local man will probably have to carry out the work in the end; and it adds to his enthusiasm and keenness if he is allowed to negotiate the business right through—provided, as I have said before, that it is of a size which he is competent to tackle. He should be relieved from housing estates, furnace work, or other tasks of a special nature, as much because he has not the necessary time to devote to them as for any other reason.

Any company which employs as its local representative a man whose personality does not allow of his meeting and negotiating with anyone on his area has not chosen its officer properly. If you limit his scope, you cannot hope to produce the man you require to fill the top places; and this has caused the lack of good men for the leading positions.

In connection with the supply of gas, unlooked-for occurrences sometimes occur—fortunately not often. Here is one of the most striking that I recall. A certain area was reported to have no gas, or, rather, that the consumers were unable to light the gas. I proceeded to the district, and found nothing but air in the mains and local supplies. The pressure of the air was about 2½ in. It was obviously being put into the main through a blower; and the extreme danger was apparent. By following the nature of the main contents, we were able to locate that the trouble came from a factory in which air under pressure was, through a workman's inadvertence, being allowed to pass into the Company's main. This was stopped, and the mains were cleared as quickly as possible. A statement was issued to the Technical Press, and there is now a Clause in modern Gas Acts that all users of air under pressure should fix a back-pressure valve to prevent any possible recurrence of this nature. At the time it was very alarming, and the consequences might have been serious. Happily, there was no further trouble.

B.C.G.A. Gas Salesmen's Circles.

Industrial Gas Salesmen's Circle.

Successful Conference at Glasgow.

Glasgow was the venue of a conference of the Industrial Salesmen's Circle on April 28. The company assembled at ten o'clock at the head offices of the Glasgow Corporation Gas Department, and were welcomed by Mr. J. W. McLUSKY, the City Gas Engineer. The visitors proceeded to Walls Street, in the heart of the city, for an inspection of the industrial appliances. Mr. J. McISAAC, who is in charge of the industrial side of Glasgow's huge undertaking, took the part of guide. The inspection of the industrial workshops was most thorough.

The visitors were impressed with the potentialities of a gas fire on the surface combustion principle. There are gas furnaces for case hardening, tempering, rivet heating, brass melting, and glass enamelling. Other special appliances are applicable to what might be called the smaller industries of Glasgow. There were, for example, special low-pressure gas burners for calendar rolling and tinsmith work generally. There is also a model brass-melting foundry which is used for the double purpose of demonstrating to prospective consumers any particular class of melting, and for providing on the premises all castings that may be required by the manufacturing works.

THE MEETING.

Mr. W. M. MASON, Manager of the British Commercial Gas Association, occupied the chair at the morning session, which was held in the well-appointed lecture hall adjacent to the furnace room of the Walls Street premises.

APPLICATION OF TOWN GAS FOR INDUSTRIAL HEATING.

By JOHN McISAAC.

I propose to depart from the usual procedure. Instead of reading a paper on matters dealing in general with our daily routine, I have collected data relating to a selected number of heating processes which are in successful operation in the Glasgow gas supply area. I trust these will prove instructive and of sufficient interest to promote a healthy discussion.

I need hardly remind you that each district has special and selective heating operations peculiar to the industries in the neighbourhood. Each operation requires ingenuity and imagination for the solution of its heating problems. The larger and more remunerative gas-fired furnaces are desired from a revenue point of view, but the design and efficiency of present-day gas-fired furnaces simplify our recommendations for the satisfactory performance of general heat-treatment operations.

The great majority of processes to which gas may be applied as a fuel are separately small consumers, but in the aggregate they account for a considerable gas consumption, and are a fruitful field for the industrial salesman's activities, with beneficial results to himself and to his undertaking. It is by the experience gained in the solving of these minor problems that the industrial salesman is able to enlarge his general knowledge of the application of gas as a fuel, which as a consequence makes the larger problems easier to solve.

In the short time at our disposal, I have chosen for illustration and discussion a few examples of both large and small processes, giving a brief summary of each operation. I also give data relative to running costs, with comparative figures where these have been available.

These are as follows:

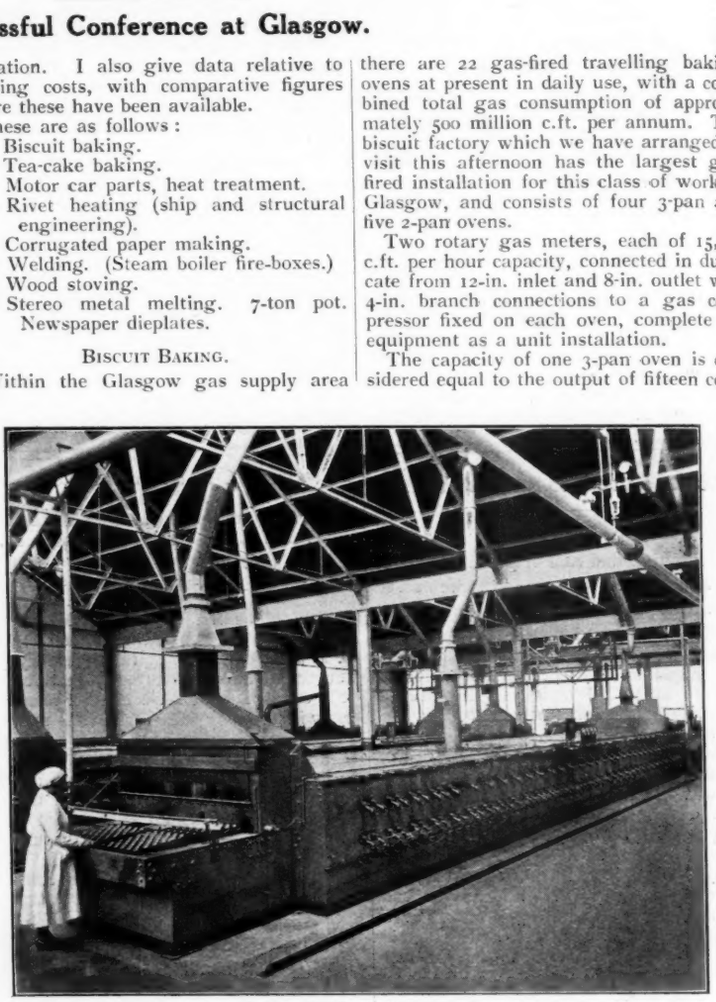
1. Biscuit baking.
2. Tea-cake baking.
3. Motor car parts, heat treatment.
4. Rivet heating (ship and structural engineering).
5. Corrugated paper making.
6. Welding. (Steam boiler fire-boxes.)
7. Wood stoving.
8. Stereo metal melting. 7-ton pot. Newspaper dieplates.

BISCUIT BAKING.

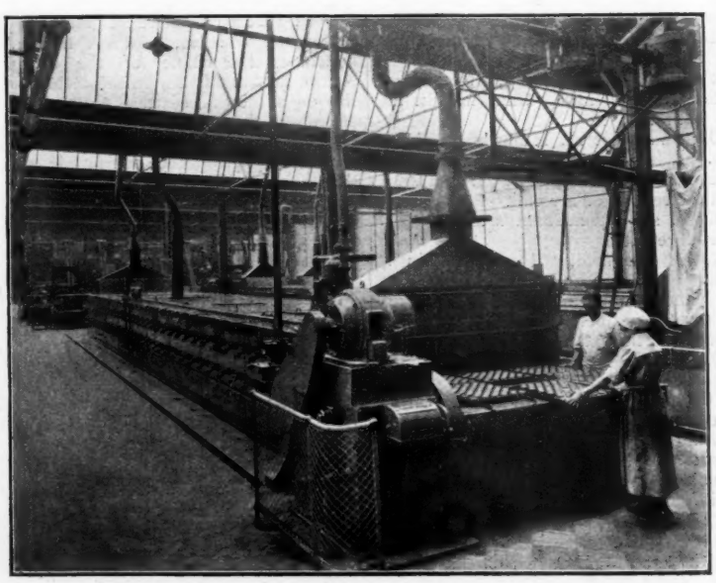
Within the Glasgow gas supply area there are 22 gas-fired travelling baking ovens at present in daily use, with a combined total gas consumption of approximately 500 million c.ft. per annum. The biscuit factory which we have arranged to visit this afternoon has the largest gas-fired installation for this class of work in Glasgow, and consists of four 3-pan and five 2-pan ovens.

Two rotary gas meters, each of 15,000 c.ft. per hour capacity, connected in duplicate from 12-in. inlet and 8-in. outlet with 4-in. branch connections to a gas compressor fixed on each oven, complete the equipment as a unit installation.

The capacity of one 3-pan oven is considered equal to the output of fifteen coke-



Three-Pan Gas-Fired Biscuit-Baking Oven. View of Feed End.



Three-Pan Gas-Fired Biscuit-Baking Oven, 50 ft. long by 7 ft. 6 in. wide. View of Delivery End. Output 1 ton 9 cwt. per day.

fired brick built Scotch ovens, and with improved quality and output the running costs are in the main equal to coke costing 32s. per ton.

DATA RELATING TO BISCUIT BAKING IN GAS-FIRED OVENS.

Size of oven	50 ft. by 7 ft. 6 in. 3 pan, each 26 in. wide.
Number of pans	63
Number of burners	70
Average number of burners working	49
Gas rate per burner per hour	36 c.ft.
" " 49 burners	1,764 "
" " " per 9 hours	15,876 "
Gas pressure	3 lbs. per sq. in.
Time to heat up from cold	60 minutes.
" " " " daily	20 "
Temperature at oven inlet	475° Fahr.
" " " outlet	460° "
Time to complete travel of 50 ft.	10·5 minutes
Number of biscuits per pan	48
Total number of biscuits in oven at one time	3,024
Total number of biscuits in oven per hour	15,000
Total number of biscuits in oven per day	135,000
Total weight of biscuits per day	1 ton 9 cwt.
Total cost of gas at 5d. per therm	£1 11s. 0d.
Cost of gas per lb. of biscuits	0·11d.

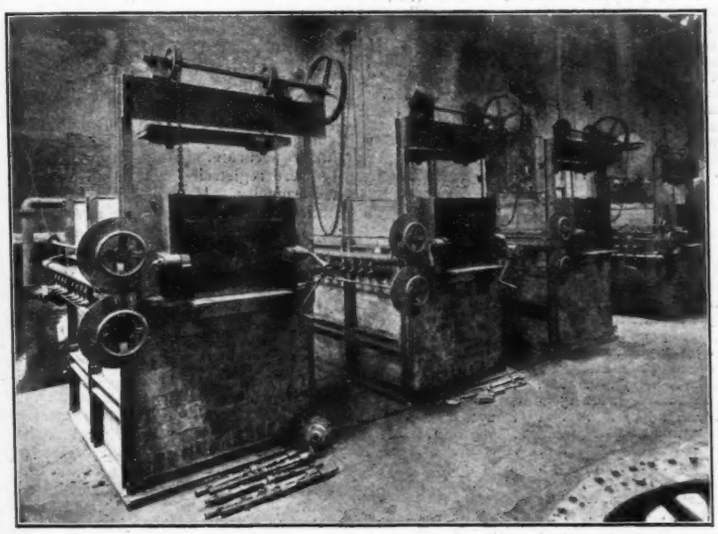
11 oz. Tea-Cakes.

Size of oven	40 ft. by 5 ft. 2 pan, each 26 in. wide.
Number of pans	48
Number of burners	62
Average number of burners working	50
Gas rate per burner per hour	23 c.ft.
" " 49 burners " "	1,127 "
" " " " 9 hours	10,143 "
Gas pressure	3 lbs. per sq. in.
Time to heat up from cold	60 minutes
" " " " daily	20 "
Temperature at oven inlet	420° Fahr.
" " " outlet	435° "
Time to complete travel of 40 ft.	50 minutes
Number of cakes per pan	15
Total number of cakes in oven at one time	720
Total number of cakes in oven per hour	864
Total number of cakes in oven per day	7776
Total weight of cakes per day	2 tons 7 cwt.
Total cost for gas at 5d. per therm	19s. 10·36d.
Cost for gas per 11 oz. cake	0·3d.

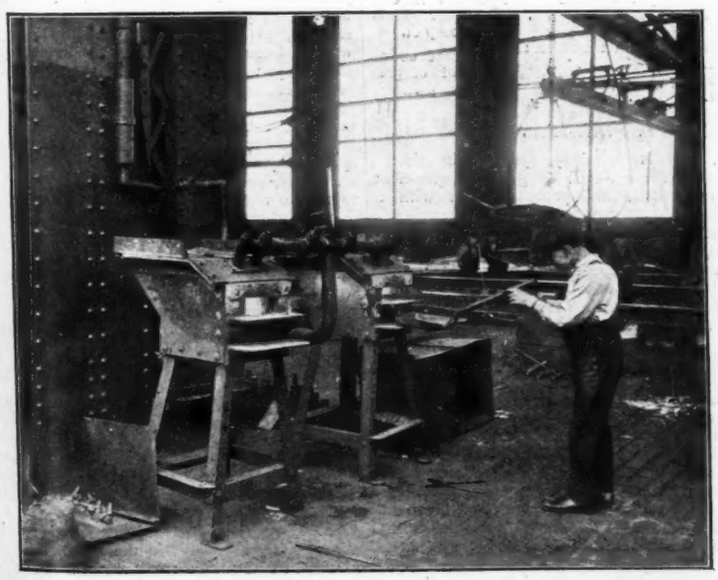
MOTOR CAR PARTS, HEAT TREATMENT.

The four gas-fired furnaces as illustrated have the following working chamber dimensions: 4 ft. long by 2 ft. wide by 15 in. to crown of arch. They are used exclusively for the hardening and tempering of motor car engine and gear parts. Each oven is capable of an average output of 1 cwt. of parts per hour for a gas consumption of 110 c.ft., which, with gas at 1s. 11½d. per 1000 c.ft., or 5d. per therm, costs 2½d. per cwt. of metal heated.

This installation is interesting in so far as while the furnaces have been installed after exhaustive tests for this particular class of work, oil furnaces have been chosen for all case-hardening work, and these are proving as satisfactory with oil costing 4d. per gallon as gas did at 5d. per therm.



Battery of Gas-Fired Furnaces for Heat-Treating Motor Parts. Working chambers 4 ft. long. by 2 ft. wide by 15 in. high.



Gas-Fired Rivet Heating Furnaces. Working chambers 15 in. deep by 12 in. wide by 6 in. high. Temp. 1100° C.; Output 176 rivets per hour.

RIVET HEATING.

The application of gas as a fuel in the shipbuilding industry on the Clyde is confined mainly to rivet heating in the frame shops, little or no effort having been made to extend the advantages to the ship under construction on the stocks. The possibilities and advantages of extending the use of gas for the large plate and angle heating furnaces is delayed for two main considerations—viz., capital expenditure and the relative cost of fuels for this class of work. For structural engineering, gas-fired rivet heating furnaces are universal; and the following data are compiled from tests made under working conditions on bridge and aerodrome girder work.

RIVET HEATING, OIL-FIRED FURNACE.

One day of 7 hours' run.

Type of furnace	Twin chamber.
Time to heat up from cold	30 minutes.
Fuel used to heat up	3 gallons.
Calorific value of fuel (tested)	17,850 B.Th.U. per lb.
Total fuel used per day	42 gallons = 378 lbs.
Cost of fuel used at 4d. per gallon	14s.
Average size of rivets	⅞ in. by 2½ in.
Total weight of rivets used	448 lbs. = 4 cwt.
Cost of power used	2d.
Price of fuel	4d. per gallon.
Number of rivets heated	1434.
Ratio = weight of rivets heated / cost of fuel and power	3·08 lbs. per penny.
Heat units used per rivet	4703·13.
Temperature of rivets	2000° Fahr.
Total heat units delivered in furnace	6,747,300.

RIVET HEATING, COKE-FIRED FURNACE.

One day run of 8½ hours.

Type of furnace	Twin chamber.
Time to heat up from cold	1½ hours.
Fuel used to heat up	3 qrs. 11 lbs.
Calorific value of fuel (tested)	11,718 B.Th.U. per lb.
Ashes per day	2 qrs. 27 lbs.
Percentage of ashes	17 lbs.
Total fuel used per day	4 cwt. 1 qr. 16 lbs.
Cost of fuel used	84·46d. = 7s. 0·46d.
Average size of rivets	⅞ in. by 2½ in.
Total weight of rivets heated	383 lbs. = 3 cwt. 1 qr. 19 lbs.
Cost of power used	1 77d.
Price of fuel	32s. per ton.
Number of rivets heated	353 5
Ratio = weight of rivets heated / cost of fuel and power	4·14 lbs. per penny.
Heat units used per rivet	16,309·07.
Temperature of rivets	2,000° Fahr.
Total heat units delivered in furnace	5,765,256.

RIVET HEATING, GAS-FIRED FURNACE.

One day run of 8½ hours.

Type of furnace	Single chamber, hopper feed.
Time to heat up from cold	35 minutes.
Fuel used to heat up	68·25 c.ft.
Calorific value of fuel per c.ft.	470 B.Th.U.
Total fuel used per day	1,950 c.ft.
Cost of fuel used	59·6d. = 4s. 11·57d.
Average size of rivets	⅞ in. by 2½ in.
Total weight of rivets used	474 lbs. = 4 cwt. 26 lbs.
Cost of power used	2·5d.
Price of fuel	2s. 6·5d. per 1000 c.ft. = 6·5d. p.therm.
Number of rivets heated	1,128
Ratio = Weight of rivets heated / Cost of fuel and power	7·9 lbs. per penny
Heat units per rivet	812·5
Temperature of rivets	2,000° Fahr.
Total heat units delivered in furnace	916,500
Increase in output over coke	47·5 p.ct.
" " over oil	61·0 p.ct.
Reduced cost over coke	29·43 p.ct.
" " over oil	64·52 p.ct.

CALENDAR HEATING.

One of the most interesting and difficult problems with which I have had to deal was successfully solved to the entire satisfaction of the manufacturers, as the following results well show:

MAKING CORRUGATED PAPER PACKING SHEETS.

Electric Heating System.

Paper machine (twin set of three rollers each).

Length of rollers	24 in.
Internal diameter of two rollers	1·75 in.
Heating elements, 2 at 8 in. long	16 in. heating
Current consumption at 2¼d. per unit	5·62d.
Total cost per day of 12 hours	67·5d.
Possible output in sheets per hour	13,350 sheets
Actual output in sheets per hour	5,000 ,,
,, ,, ,, ,, 12 hours	60,000 ,,
Wastage at 5 p.ct.	3,000 ,,
Total output loss	64·42 p.ct.

Gas Heating System.

Details of machine and rollers same as before.

Gas heating burners, four	24 in. heating
Gas consumption rate per burner	20 c.ft. per hour
Gas consumption rate four burners	80 ,, ,, ,,
Cost of gas at 8·09d. per therm	3·04d.
Total cost per day of 12 hours	36·4d.
Possible output in sheets per hour	13,350 sheets
Actual output in sheets per hour	13,350 ,,
Wastage	*Nil*
Total output	100 p.ct.

Notes.

Electric hourly cost, 5·62d. / Gas ,, ,, 3·04d.	Gas 46 p.ct. cheaper.
Electric system output, 60,000 sheets / Gas system output, 180,000 sheets	Increase in output with gas, 66·6 p.ct.

WELDING—GAS AND AIR BLAST SYSTEM.

The following heating process, the welding of steam boiler fire-box barrels, is not common so far as town gas firing is concerned. I am unable to give comparative figures for welding with coke; but it is admitted that gas is cheaper and more satisfactory in every respect.

Size of barrel	48 in. long by 39 in. dia. by ½ in. thick
Length of weld	48 in.
Number of heats	7
Temperature of weld	1,450° C.
Time per heat	8·57 min.
Time to complete 4 ft. weld	1 hour
Gas consumption rate per hour	2,400 c.ft.
Therms per hour	11·29
Therms per heat	1·6142
Price of gas per therm	6·5d.
Number of barrels per day	5
Fuel cost per barrel	6s. 1·395d.

GAS-FIRED WOOD STOVING CHAMBER.

The process of stoving wood is usually completed by the use of steam or hot air, both of which are economical and satisfactory; yet the use of gas as the heating medium has been successfully practised.

The following data relate to an installation now operating:

Size of oven	20 ft. long by 9 ft. wide by 8 ft. high.
Walls	9 in. brickwork
Roof	6 in. concrete
Temperature for 36 hours	120° Fahr.
,, ,, 12 ,,	225° ,,
Total time of stoving	48 hours
Gas consumption rate per hour at 120° Fahr.	180 c.ft.
Gas consumption rate per hour at 225° Fahr.	220 ,,
Time to raise temperature from cold to 120° Fahr.	2½ hours
Time to raise temperature from 120° to 225° Fahr.	30 minutes
Cost for gas at 3s. 2d. per 1000 c.ft. for 36 hours	21s. 7d.
Cost for gas at 3s. 2d. per 1000 c.ft. for 12 hours	8s. 8d.
Total gas consumption for 48 hours	9120 c.ft.
Total cost for gas for 48 hours	30s. 3d.
Total load of wood in oven	2 tons 15 cwt.
Total superficial area of wood	250 sq. yards, ⅞ in. thick
Cost for stoving per square foot	0·116d.

NEWSPAPER DIEPLATE CASTING.

The production of newspapers must work to a time-table without fail—not merely to satisfy the local demands, but to ensure that supplies for outlying districts will be available for transit according to railway facilities. To ensure prompt and certain results, gas has proved to be the most reliable fuel available.

The purposes for which gas is used are as follows: Linotype machines, zinco-plate work, chemical heating, matrix drying, blowpipes, alloy mixing, and stereo metal melting for die-plate casting. The following tabulated data show comparative results with the use of gas and oil for die-plate casting:

7-TON STEREO POT.

OIL-FIRING BURNER EQUIPMENT.

Dual System.

Number of hours worked per day	9
Number of plates cast per day	154
Number of plates cast per hour	17
Weight of plate including head	86 lbs.
Weight of plate added cold	70 lbs.
Oil consumption rate per hour	2·75 gallons.
Gas consumption (maintenance) per hour	246 c.ft.
Gas consumption (maintenance) for 15 hours	3690 c.ft.
Gas consumption (maintenance) for 24 hours	3690 c.ft.
Working temperature	600° Fahr.
Maintenance temperature	500° ,,
Fuel cost 5·5d. per gallon	1·62 therms.
Fuel used per plate cast	0·154 gallon
Fuel cost per plate cast (oil only)	0·84d.
Total cost for fuel per 24 hours at 23·75 gallons of oil = 38·47 therms at 5·5d. per gallon	= 10s. 10·6d.
Total gas fuel cost for maintenance, 17·39 therms at 5d. per therm	= 7s. 3d.
Total cost for fuel per 24 hours = 41·14 therms	= 18s. 1d.

7-TON STEREO POT.

GAS-FIRING BURNER EQUIPMENT.

Number of hours worked per day	9
Number of plates cast per day	198
Number of plates cast per hour	22
Weight of plate including head	86 lbs.
Weight of plate added cold	70 lbs.
Gas consumption rate per hour	510 c.ft.
Gas consumption rate per hour (maintenance)	180 c.ft.
Gas consumption for 15 hours (maintenance)	2700 c.ft.
Gas consumption for 24 hours	7290 c.ft.
Working temperature	600° Fahr.
Maintenance temperature	500° ,,
Fuel cost 1s. 11·5d. per 1000 c.ft.	5d. per therm
Fuel used per plate cast per hour	23·18 c.ft.
Fuel cost per plate cast	0·54d.
Total cost for fuel per 24 hours at 5d. per therm = 34·35 therms	= 14s. 4d.
Gas at 198 plates per hour / Oil at 154 ,, ,,	Difference increase in output for gas = 22 p.ct.
Gas at 5d. per therm costs 14s. 4d. / Oil at 3·4d. per therm costs 18s. 1d.	Difference in favour of gas, 21 p.ct.

Discussion.

Mr. ENNELS (London), opening the discussion, said there would be general agreement that the author had provided them with a large amount of valuable information. So far as the wood stoving operations were concerned, he would ask if Mr. McIsaac could give some supplementary data and information. For instance, what capacity of pot would the author consider for application in (say) the different processes of cabinet making? Additional details on the subject of stereo metal melting would be useful.

Mr. MCISAAC replied that, since the subject of wood stoving had been raised, he might explain that the particular operation dealt with in his paper had reference to wood stoving for making fireproof doors. This, he understood, was a new regulation that had come into force. Hitherto many of these doors had failed when subjected to the test of a fire, and the insurance authorities were now insisting that the wood must be thoroughly seasoned, dried, and impregnated with creosote. The insistence upon that regulation by the insurance companies had made it necessary that the makers of these particular doors should go to the expense of having the wood heat-treated. He could not see why the same operation should not be made applicable to any form of wood drying. So far as stereo metal melting was concerned, he would use this process for anything below 5 cwt.

Mr. BROWN (Sheffield) asked whether the author found variations in the stereo metal? In Sheffield this was most noticeable in regard to linotype machinery. Had the author discovered any arrangement which gave consistent temperature control?

Mr. MCISAAC said that temperature control in any kind of type metal was easily achieved.

Mr. LEASK (Leeds) observed that this question of stereo melting was very important. In Leeds, two of the newspapers used gas. The comparative figures the author had furnished would be most useful, particularly to those industrial gas salesman who were faced with competition in catering for newspaper business. He observed that the author, for his 7-ton stereo pot fired by gas, gave a maintenance gas consumption rate per hour of 180 c.ft. This approximated to the figure they obtained in Leeds. On the other hand, with an oil-firing burner equipment, the gas consumption maintenance per hour was stated to be 246 c.ft. Was there any reason why this figure should be higher than when the pot was fired by gas during the whole of the day? With regard to biscuit baking, Mr. McIsaac alluded to two rotary gas meters each of a capacity of 15,000 c.ft. per hour. Could these meters be relied on to give accurate registration?

Mr. MCISAAC said he anticipated that the two points dealt with by Mr. Leask would be raised. In the gas burner equipment for stereo melting they were using a high-pressure supply, while in the dual system, low-pressure gas was used in conjunction with oil. Regarding the totary meters, they were not absolutely accurate. They were correct when they were registering within 10 p.ct. of their rated capacity. If those present thought of installing a rotary meter, he advised them to have a dry meter alongside, to take on the load up to 10 or 15 p.ct. of the rotary meter rating. If this was not done, then the alternative was to come to an agreement with the consumer to pay a definite sum to cover the unregistered gas. In the particular instance dealt with in the paper, such an arrangement had been made.

Mr. W. H. BECKET (London) said he would like to hear the author's views on having furnaces efficiently lagged. On the subject of biscuit making, those present might be interested to know the experience of one of the largest confectioners in London. He referred to the firm of Lyons. That firm had gone thoroughly into the problem of gas as applied to the manufacture of all their different productions, such as biscuit baking, cakes, &c., and their Chief Engineer told him the other day that, for a working temperature of anything below 500° Fahr., gas was a thoroughly economical proposition. That gentleman took the view that above 500° Fahr. oil held the field. In London, in the undertaking with which he was associated, they had an experimental workshop where those in charge were expected to assist the gas salesmen with the problems that came before them. Something more, he thought, was required. They needed a trained experimental staff with one or two specially qualified in analytical chemistry. At all events, one specialist was necessary. With regard to the application of gas to the newspaper industry, he noticed that Mr. McIsaac made no reference to steam raising in the printing trade.

Mr. MCISAAC said that furnaces should be lagged. He agreed with the opinion expressed by Mr. Becket regarding the appointment of an analytical chemist. So far as Glasgow was concerned, he did not think there were any newspapers that would use gas to raise steam for the matrix drying tables.

The CHAIRMAN said he knew of no district in the gas industry that was so efficiently and effectively served on the scientific side as was the City of Birmingham. He was sure Mr. Hems, who was present, was in a position to impart a good deal of useful information.

Mr. HEMS (Birmingham) remarked that he was specially interested in the author's figures relating to the heat-treatment of motor-car parts. What was the actual operation for the data given by Mr. McIsaac? The figure was such an extraordinarily good one that he wondered if it applied to a short period or to

the entire length of the operation. He had followed what the author and Mr. Becket had said in the matter of lagging; but it should be borne in mind that they had got to be very careful that there must always be a use for a short period furnace. If they had a furnace that was only occasionally used, it was unwise to lag it to any great extent. Proceeding to deal with gas development policy in Birmingham. It was in the middle of the war that they realized the importance of giving manufacturers advice with regard to their heating work, and it was felt that an industrial research department should be formed so as to obtain detailed information of the processes likely to benefit and interest industrial consumers. From that industrial research department there had emerged an industrial and commercial heat section which was equipped with physical and chemical laboratories. Astonishing results had followed in the wake of this development. In Birmingham they were about to launch a scheme of inspection. That was bound to bring new business, and—what was of equal importance—it would have the effect of consolidating the work already done.

Mr. McISAAC indicated in his reply to Mr. Hems that the figures for motor-car parts applied to general work—anything, in fact, which required hardening treatment and tempering. The figures had been taken over a considerable period.

Mr. RENNISON (Sheffield) asked for supplementary details relative to the boiler welding equipment. Did the author use an ordinary blast furnace?

Mr. McISAAC replied that this particular burner equipment was designed by the people for whom the job was done, and he was not at liberty to divulge information respecting it. Reverting again to the question of motor-car parts, the author admitted that the figure was a low one. The policy adopted was not to overload the furnace with a large quantity of metal, but to maintain a constant load throughout.

Mr. A. B. MUNROE (Edinburgh) said that Edinburgh was an acknowledged centre of the printing trade. Recently his Corporation had succeeded in installing gas for "The Scotsman," which had the reputation of being the premier publication in the Scottish newspaper world. The annual consumption of this paper was about 8 million c.ft. In the confectionery trade, they had proved that gas effected economies. After many attempts, the Gas Department were able to demonstrate to one of the biggest firms of typefounders in Great Britain that the work could be done much more economically by gas than by solid fuel. These experiments were backed-up by a deputation of the workers, who asked that gas should supersede every other agency. The Gas Department were now proceeding with the work, which would add 10 million c.ft. to the annual consumption. Mr. Munroe suggested that a sliding-scale should be adopted in the case of industrial users.

On the call of Mr. A. B. ROXBURGH (Newcastle), a vote of thanks was passed to the author, who briefly replied.

AFTERNOON SESSION.

Following luncheon, the delegates reassembled in Wilson Street, and were divided into two groups. One section proceeded to the Albion Motor Car Works, South Street, Scotstoun, and having made a thorough inspection of this well-equipped concern, returned to Messrs. Macfarlane, Lang, & Co.'s biscuit factory at Tollcross. Here the application of gas in the manufacture of biscuits was demonstrated in practical fashion. The second group carried out the same programme with the order of works visitation reversed.

Midlands Circle.

A Meeting of the Circle was held at the Offices of the Cheltenham Gas Light and Coke Company on Wednesday, April 14.

Mr. A. H. Wyatt and Mr. S. G. Wood (Directors), Mr. L. E. Twycross (Engineer and Works Manager), and Mr. C. W. Welford (Commercial Manager), of the Cheltenham Gas Light and Coke Company, were present.

Mr. WELFORD, on behalf of the Company, welcomed the Circle.

Mr. W. WILBERFORCE (Chairman of the Circle) thanked Mr. Welford for his welcome and the Directors for their presence. They were to have a paper from Mr. T. B. Armitage, of Cheltenham, on "Maintenance." They must tread warily with their maintenance schemes, lest they found themselves taking over responsibilities unnecessarily, and embarking on expense for which they would see no adequate return in increased consumption or increased satisfaction of the consumer.

MAINTENANCE.

By T. B. ARMITAGE, of Cheltenham.

Generally speaking, I think it will be agreed that gas appliances are not effectively and efficiently maintained by the average gas consumer. No doubt most of us have received complaints about the quality and supply of gas which, when investigated, are found to be due to dirty or badly-adjusted appliances.

In some undertakings, while the sale of new apparatus is being pushed for all it is worth—which, of course, is very desirable—the maintenance of existing apparatus is neglected. We must remember that apparatus kept in efficient working condition form our greatest asset in meeting our competitor, as a satisfied consumer is unlikely to change.

It should be part of any maintenance system to endeavour to persuade the consumer to have obsolete appliances modernized, if by doing so he can obtain higher efficiency. If this modernizing is not an economical proposition, then an effort should be made to scrap the old appliance, and instal something of more recent manufacture which will give more economical and efficient service.

While I am a firm believer that the maintenance of gas appliances is a most important section of our business, I am also of the opinion that it can be overdone—that it is bad policy to have to tell our consumers that it is necessary for a man from the gas undertaking to see to his burners, appliances, &c., every four or five weeks. If all burners and appliances are of sound construction, and have been fitted by competent workmen, there will be no necessity to send round maintenance men at such short intervals. There are, of course, exceptions, particularly in the lighting of factories, shops, public halls, &c. It should be our aim to purchase only fittings that are of sound construction, and to shun the cheap and shoddy goods which have only cheapness in first cost to recommend them. We must first and foremost strive to give efficiency and durability. It is not enough to say that we have a sale for this class of goods. Were we all of one mind, and refrained from purchasing them, their manufacture would soon cease. This is a thing about which I feel very strongly, as perhaps we are not so careful about this matter as we might be. In my opinion cost must take second place to efficiency in every instance, and more technical knowledge should be employed in buying our appliances, fittings, &c., than has been exercised in the past. Let us put all haphazard methods on the shelf, and buy only goods that will do us as an industry credit, as I am confident that more consumers are lost through shoddy appliances and fittings than from any other cause, as in most cases it is the gas, not the appliance, that gets the blame. In Cheltenham we undertake the maintenance of all slot consumers' fittings free of all charge; and here again I would emphasize the advisability of purchasing only first-class fittings.

With reference to the maintenance of ordinary consumers' burners and appliances, some months ago we circularized the ordinary consumers in Cheltenham, to inspect and adjust their burners, &c., quarterly, charging only for the materials used, the labour to be done free of charge. At first this did not bring a very ready response; only a few hundred accepting the offer. But as time progressed the number of acceptances increased, and to-day we have about 20 p.ct. of our ordinary consumers on our maintenance list, and the number is still increasing. I may say that in addition to keeping consumers' apparatus in a satisfactory condition, thereby making satisfied consumers, an appreciable amount of new business has been received as a direct result of our maintenance attendants' work.

The actual work performed by these maintenance fitters is, I suppose, the same as in most other undertakings where any maintenance system is in operation. Lighting appliances and burners are thoroughly cleaned and adjusted, new mantles fixed where necessary (the number of mantles being signed-for by the consumers), and the glassware cleaned. The domestic cooker, if properly fitted and adjusted, needs little maintenance. Most complaints are due to want of ordinary care and attention, and are soon rectified. With larger apparatus used in hotels and boarding-houses, we find maintenance most important, as often these appliances do not receive the care and attention they deserve. As we have a large number of big hotels and boarding-houses in our district, this is a most important matter to us, for if these appliances are not regularly attended to, their efficiency is quickly impaired, and a dissatisfied consumer is the result. Gas fires and radiators need occasional attention if maximum efficiency is to be maintained, as the amount of dust and dirt that collects in the burners and injectors is really surprising. This is perhaps most noticeable with inset fires; but in all cases periodical inspection is advisable. With reference to the steam type of radiator, in addition to the burner the thermostat may need attention.

Water heaters certainly require inspection if the best results are to be obtained, particularly if the water is inclined to be hard. In Cheltenham the water contains 15° of hardness. We found that with thermostats set to operate at 150° (at which temperature most thermostats are set by the makers to operate) we had trouble in a short time, but we found that at 135° a boiler could be safely left for 6 to 12 months. Therefore all our thermostats are set to operate at 135°. We are able to use this as a selling point over solid fuel boilers, in connection with which no automatic regulation of temperature can be made.

Another point to be considered is the type of man who is to do this maintenance work. We must remember that the maintenance fitter is often called upon to act as a salesman on the district. Therefore he must be able to advise the consumer on any future requirements, in addition to adjusting appliances. In Cheltenham, our maintenance fitters were selected from fitters' mates who had been with first-class fitters for years, and were given special training before being put on this work. These men, when they make their periodical call, go through the whole

of the apparatus on the premises, with the exception of water heaters. A first-class fitter is always sent to the latter type of apparatus. Some system of maintenance is an absolute necessity.

Discussion.

The CHAIRMAN said that it was undoubtedly time that steps were taken to see that cheap fittings and apparatus were forced out of the market. Undertakings sometimes had to maintain inferior fittings which they had not supplied.

Mr. G. HILEY (Birmingham) thought that lighting burners required more than one visit per quarter, especially during the winter months. Maintenance in Birmingham had been the means of increasing sales and at the same time had proved a good opportunity for cutting-out inferior fittings. Maintenance of cookers, fires, and burners should come under one head, to reduce overhead charges.

Mr. WILSON (Leamington) raised the question of maintenance of circulators in hard water districts. What time elapsed before it was necessary to clean out? Was a charge made for this work?

Mr. G. BURDEN (Redditch) asked for more information as to how the scheme was started in Cheltenham, how long it took to get into operation, and whether the same man did the maintenance of fires, cookers, and lighting?

Mr. WYATT remarked that the degree of hardness varied in the town from 15° to 20°, according to whether Severn or Hill water was used. How could the thermostat be adjusted to meet the variation?

Mr. W. E. CADWALLADER (Birmingham) said that in Birmingham consumers' own apparatus was not maintained free, but at a nominal charge. All hired apparatus was maintained free. Gas fires and hot water apparatus were visited once per annum, and cookers when a complaint was received. Yearly inspection of domestic gas fires had proved sufficient, but fires in offices and factories required more attention. Labour charges for maintenance of gas-steam radiators had proved heavy. Gas fires were light for fuel breakage, as out of about 30,000 to 40,000 fires on maintenance, the average was about two fuels per fire per annum. Gas fire flues were cleared about every two or three years, and it was found that the back firebrick broke readily. In fact, the percentage was as high as 80 or 90. These bricks could be repaired neatly and efficiently by "Tamac."

Mr. S. W. SIMMONS (Dudley) agreed that the cost of maintaining steam radiators was heavy. The maintenance of the slot cooker was very necessary, as the prepayment consumer was responsible for a heavy load. In the case of change of tenancy, was the cooker changed or cleaned free? He would like to know if any figures were available as to the cost per cooker for renovation, and for changing to the high efficiency hotplate.

Mr. W. L. SPINKS (Birmingham) thought that services over a certain age should be examined during the summer months. With regard to corrosion in water heaters, the number of degrees of hardness had no relation to the temperature at which carbonate or sulphate was deposited. If the deposit was lime, he questioned whether there was much deposit at 150° Fahr., as he understood that lime deposited heavily about boiling-point of water, and as long as the temperature was kept well below this, apparatus was comparatively safe. He had been surprised at the high percentage of gas fire bricks broken, and thought that this was a matter which makers should take up in their research laboratories.

Mr. G. M. LEWIS (Birmingham) said that the Butterfield report was undoubtedly one of the prime movers in this question of maintenance, as in that report it had been suggested that gas undertakings should be responsible for all apparatus. There was no such thing as free maintenance, as maintenance was paid for in the price of gas. The best way to tackle the problem was at the source. Buyers should see that apparatus was as efficient as possible, of the best quality, and fool-proof. If an undertaking obtained a reputation for service, was a maintenance scheme so necessary? Each undertaking should inform the public that they would get prompt and sympathetic attention to all inquiries and complaints. Modern gas fittings could be guaranteed for at least ten years, and it was a good idea in the slack season to change old slot fittings for modern fittings of good standard quality.

Mr. ARMITAGE, replying, said he found it necessary to visit circulators in Cheltenham every six months. With the thermostat set at 135°, circulators would go for 6 to 12 months; but set at 150°, a visit was necessary every three months. He had had a case with 16° of hardness, where the bottom of the circulator was solid with corrosion after six weeks. Their maintenance scheme commenced by circularizing the whole of the ordinary consumers; and the same fitter did all types of maintenance—cookers, fires, and lighting. In cases of changes of tenancy, cookers were changed free of charge if they were in a very dirty condition. They were gradually replacing all old cooker hotplates by the high efficiency type, and it worked out at about 20s. per cooker. He agreed with the idea of maintaining services. He thought that undertakings in soft water districts had the advantage, as copper boilers and lead pipes could be installed. He agreed that the domestic cooker required very little maintenance, but such was not the case in hotels and boarding houses. As to the idea of a service department instead of a maintenance scheme, he pointed out that consumers would not always lay their complaints in the proper quarter, but would complain to neighbours, and in this way do harm. With periodical inspection, this was obviated to a great extent.

A hearty vote of thanks was accorded Mr. Armitage on the proposition of Mr. DAVIES (West Bromwich), seconded by Mr. SIMMONS (Dudley).

It was proposed and seconded that the Circle should accept the invitation of the Leicester Gas Department to visit the Health Exhibition at Leicester on May 15, and the invitation of the Dudley Gas Light Company to visit the Exhibition at Dudley on May 5.

Scottish Circle.

The Annual General Meeting of the Scottish Salesmen's Circle was held in Edinburgh on April 21. Mr. J. JAMIESON, Assistant Gas Engineer to the Edinburgh Corporation, and a former President of the Circle, occupied the chair.

The HON. SECRETARY (Mr. A. B. Munroe) submitted the report of the Council. In this it was stated that the attendances at meetings have been maintained, but it is unfortunate that the Circle does not receive support from every undertaking in the East of Scotland. The Circle is now in a satisfactory financial position, having a credit balance of £16.

The report was unanimously adopted.

NEW OFFICE-BEARERS.

Thereafter the meeting proceeded to the election of office-bearers for the ensuing session. The vacant offices were adjusted as follows:

President.—Mr. J. Graham, Kilmarnock.

Hon. Secretary and Treasurer.—Mr. A. B. Munroe, Edinburgh.

The present members of Council were appointed *en bloc* for another year, with the addition of Messrs. D. Yule and J. Hewit, of Edinburgh.

POINTS FROM EXPERIENCE.

Paper by A. B. MUNROE.

I am inclined to the belief that a gas salesman is called upon to render service to a greater degree than in any other profession. Our field of activity is so great, and the demands on our service are so numerous, that we forget those who are not yet aware of the value of gas either for domestic or for industrial purposes.

Let me turn your thoughts to possible domestic consumers who have not yet enjoyed the use of gas for cooking, and see if an easy way can be found of gaining new business. All live undertakings have equipped themselves with records of the appliances which are in use in their supply area. It is an easy matter then to list those who are without gas appliances. To such unfortunates, a letter should be addressed, stating clearly the advantages and economies to be obtained by using gas for such a purpose, and offering free advice on how their particular requirements may be met by the services of the undertaking. Within three days of receipt of that letter, a representative should call and explain what his particular undertaking is prepared to do to make the housewife's task more pleasant and convenient. The same method, of course, can be applied for developing the use of gas for heating. The fact that gas is already installed gives the gas salesman a means of access to his customer—a privilege enjoyed by few business builders.

The development of the industrial load is a more difficult problem. One has to possess a knowledge of mechanics and the heat treatment of metals. A spirit of optimism, and confidence in what one is selling, help one when interviewing possible consumers. You will probably be surprised how little the other fellow knows about his needs. Seldom will you get reliable information as to what temperatures are required, or even the actual working costs of any particular operation, to give you a chance of quoting what gas would cost to do the same operation. You will find an inherent objection to change-over from solid fuel—not because your word is doubted, but because anything that savours of change is always looked upon with suspicion when existing methods have worked more or less satisfactorily for many years—unless you can guarantee greater output, and show more hygienic conditions, and a cost which will not be greater than the figures quoted to you.

In this connection let me relate a recent experience. Edinburgh, as you know, is the centre of the printing industry in Scotland. In December last I called on a type-metal founder, and after discussion obtained his permission to experiment on one of his machines. My only hope of obtaining this business was in being able to introduce a burner which would do the work as efficiently and as cheaply as coal. Whatever coal can do, gas can do better; the difficulty is the cost. The first burner used was built for ordinary town pressure, and did the work well enough, but at double the cost of coal. I then turned to using gas with air under pressure. This gave economic results, but did not melt the metal quickly enough, or maintain the metal hot enough to give good results. My third and fourth burners did the work perfectly, but at 5 p.ct. more than the cost of coal. The thickness of the pots varied from 1½ in. at the base to ⅜ in. at the top; and it was observed that the metal round the sides was always in the best condition for working. So I obtained permission to reduce this bottom thickness, and prepared a three-section burner capable of passing 30 c.ft. per hour when full on, and 20 c.ft. when working on by-pass. The metal is melted in 55 minutes from a cold start, and when on by-pass is maintained in working condition. The price for gas is now equal to the cost for coal, but the wear on the furnace is less, and there is less waste in so far as varying temperatures have a bad effect on the antimony used in the process of metal stamping. With coal, the section known as the "choker" has to be repaired every other day. After five weeks' use on the gas-fired furnace, the "choker" has still to receive its first attention.

Greater output is obtained. The night watchman lights up the machine one hour before the workmen commence, with the result that there is no waiting for the coal fire to get up heat, or until the wind changes, and gives the flues a chance to pull. Already eight machines have been converted; and when the installation is complete the annual consumption will be fully 3 million c.ft. The texture of the type on the gas-fired furnace is more solid than that obtained from the coal-fired furnace. Being more solid, it is heavier; and since type is sold by weight, you will readily understand the advantages the manufacturer will gain. Already a deputation of the workmen have waited on the manufacturer, and expressed their desire for the conversion of their machines; so it is obvious that the advantages are not all with the employers.

I mention this particular case for one purpose only. The manufacturer is keen to reduce his working costs; and if you can show good reason for the application of gas, and are willing to give time, and bear the expense of your experiments, you will find the average manufacturer keen to accord you every facility in his workshop. Do not wait till the other fellow gets in or the manufacturer seeks your advice. Most businesses have obtained their success by arranging for their representatives to call regularly on possible clients. Why should not we in the gas industry adopt the same policy?

A great deal has recently been written, and much has been said, about the attitude of gas undertakings to new property; and since the purpose of this paper is really to create discussion, a few remarks on this field of remunerative business will not be amiss. Architects and builders demand our closest attention. Everybody is after their business; and if we are prepared to wait until our services are requested, then we must not express disappointment if our competitors get their business. It is no use shouting that gas is cheaper than any other fuel. What we have to make the architect and builder realize is that the demands and requirements of the modern woman can best be met by the use of gas appliances, and that if they want to find a ready market for their houses, they are assured of quick sales by having all new property equipped with modern gas fitments.

To deal with architects and builders is a specialist's job. He should be responsible for making regular calls on all businesses interested in building work, keeping in touch with the Dean of Guild Court applications, with the local housing authorities, and city or town architects or burgh surveyors. It should be his duty to arrange about gas services, meter positions, and generally be the pioneer for his department's goods. To wait until the plans have been approved is only equal to closing the door when the horse has bolted. You must always be on the doorstep if you want to get the architects' and builders' business. How many bad installations of gas fires are due to the architect or builder not knowing that it was necessary for a gas fire to be equipped with a proper flue, terminating over the roof of the house? How many wash boilers are never used because the outlets consist of ordinary iron drain pipes, which have become encrusted with corrosion or failed to work because the flue outlet terminated in a so-called "ventilating" brick? If there is one part of a house where a flue is required, surely it is in the scullery—not only for the emission of the products of combustion from the gas cooker or wash boiler, but for the removal of steam, the smell of cooked foodstuffs, and for ensuring ventilation to aid in the drying of clothes when the weather does not allow of outside airing. How many sculleries do you know of that are fitted with flues? How many bathrooms in modern houses have a flue connection in the bathroom, to allow for the fitting of a geyser? Yet we in Scotland know only too well that it is the lack of flue outlets in bathrooms that hinders us from meeting the requirements of many of our consumers who have bathrooms, but no hot water installation in their homes.

Architects and builders are like ourselves. They must show progress if they want to be in business. Their knowledge of gas appliances must be improved if our potential consumers are to enjoy the great service and economies of gas. The demand for gas makes it imperative for architects and builders to give consideration to the recommendations of the gas salesman. Opposition can only arise through prejudice or from experiences which have been obtained through the use of obsolete and inappropriate appliances, improper fitting, and lack of knowledge of the proper application of gas.

Our industry must do more in this direction than it is doing. It is not enough for us to content ourselves because gas can do an equal service with its competitor at about one-third the cost. So long as coal fires are fitted in dining-rooms and bedrooms, our service to the building trade is incomplete.

There is still room for improvement in the appliances we offer. I do not discount the great advance in hotplate construction that has taken place in recent years. Higher efficiencies have been obtained without any sacrifice of time or convenience; but the gas ovens in the most modern cookers do not give that regular and even cooking which was obtained in the hot air oven of a good coal range. So long as it is necessary for the cook to alter the position of foodstuffs during preparation, we cannot claim to give efficient service. It is in such a matter that the salesman's experiences can be of great value to the maker of appliances. I believe that the complaint I have just mentioned could be easily remedied. For obvious reasons I withhold my opinion meantime.

We are all acquainted with the methods which were introduced some fifteen years ago to popularize the use of gas for domestic purposes. Cooking appliances were supplied on free loan, gas-fires were supplied on low rental terms, and fitting within certain limits was completed free of charge. Since those days, gas has become a household necessity—womenfolk have realized that the coal range is an enemy to household economy. Has not the time arrived when we should turn our attention to the sale of cooking and heating appliances, thereby being assured of our consumers taking a greater care in what would be their private property, and incidentally being more appreciative of what is termed "free maintenance"? Remember that the fewer charges your revenue accounts have to meet, the greater prospects there are for gas being reduced in price.

I have experience in undertakings which supplied cooking appliances on free loan and fires on low rentals, and also in an undertaking where such appliances were only supplied on sale outright or on hire-purchase terms. I am certain that the services of the undertaking which adopted the sale and hire-purchase business only were the most appreciated by the consumers. Certainly the average gas account was greater. There is a market in every area for the hire-purchase of these appliances. It only requires to be introduced, and the appliances offered on easy terms, to make the business a success. In Burnley the Manager, Mr. H. Clegg, introduced the system of supplying gas fires on low rental, but it was found that while the scheme was successful so far as applications were concerned, consumers preferred to purchase outright or have their appliances on hire-purchase terms. Since a fixed charge was included in the sale price or the hire-purchase terms, the Department were satisfied with a small percentage on the actual cost of the appliances, to meet handling charges, &c. Less than 1 p.ct. of these appliances were returned, and the hire-purchase terms were extended over a period of three years. My experiences in Edinburgh are similar to the results obtained at Burnley. During last year, we sold or hire-purchased five fires for every fire fitted on simple hire terms. With regard to cooking appliances, we are sending out two on sale or hire purchase for every one supplied on free loan. Less than 2 p.ct. of these appliances are returned to our workshops, and we have a ready market for such goods. The problem of free maintenance of these appliances may raise certain doubts in your minds as to the wisdom of adopting such a policy. So far no difficulties have presented themselves. Tin-ware and control cocks are the only parts which have required renewal.

To justify the term "salesmen," we want first of all to be enthusiastic in developing the sale of what our undertakings manufacture. But our business does not finish there. Just as your customer would not be content to equip his home with the plainest or meanest of furniture, so you should train him to go in for the gas appliances which you believe will give him the greatest service, and ensure his obtaining it at the lowest possible cost for gas. Free loan appliances were designed when gas was sold at such a price that the efficiency of the hotplate or oven was not the first concern. Indeed, in those days the possibilities of gas were not fully realized. Those appliances have served their purpose; now that electrical undertakings are out to capture the domestic business it is up to us to recommend the appliance which will ensure our commodity giving economic service.

The paper elicited no criticism, but complimentary references to the author's able contribution were made by Messrs. J. Jamieson, R. Chisholm, J. Wallace, J. Hewit, H. Duff, G. Keillor, jnr., J. Graham, D. Yule, W. Baxter, J. Russell, and R. Air.

Falmouth Showrooms.

After extensive re-arrangement and rebuilding, the offices and showrooms of the Falmouth Gas Company are now, to quote a local paper, "one of the most attractive business premises in the town." During the past few years there has been a gradual reconstruction and extension of the whole of the works and plant; and the new showrooms constitute the completion of a well-designed scheme.

The window frontage of the showrooms extends the whole length of the building, so that ample opportunity is given for good display. The interior of the showrooms presents a most attractive appearance, and considerable taste has been exercised in the lay-out. There are gas fires in different settings, a bathroom equipped with gas-heated hot water apparatus, and a well-arranged selection of cookers, &c.

The first and second floors have been planned in an excellent manner, and the numerous departments have been arranged for smoothness in working. The old board-room has been turned into a well-arranged stock-room. In its place a new board-room has been constructed which will also serve for cookery demonstrations, &c.

There is a testing laboratory, stock-keeper's office, surplus stock-room, and collector's, outside district superintendent's, and storekeeper's offices. A new fitting shop has been erected, and in the basement meters and heavy goods are kept.

The Company, and Mr. H. H. Hoare, their Engineer and Manager, are to be congratulated on their enterprise. The output of gas by the Company has increased since the war from 52 to 71 million c.ft. per annum, and the sale of appliances in even greater proportion.

An Elementary Treatise on Gas Lighting.

For the Student Gas Salesman.

[COMMUNICATED.]

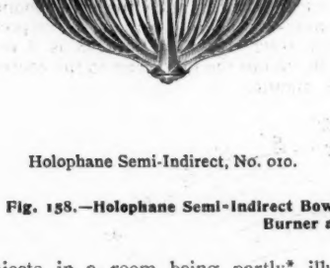
(*Continued from p.* 99.)

Direct, Indirect, and Semi-Indirect Methods of Lighting, and their Relative Efficiencies, &c.

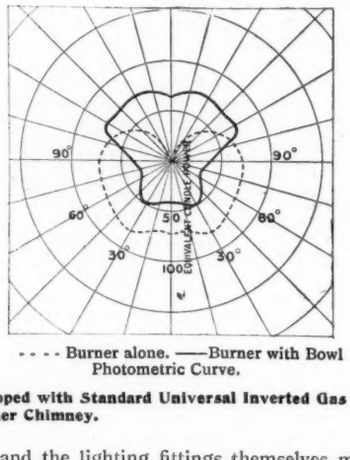
There are three distinct methods of utilizing a light source when indoor illumination is under consideration; and the architecture of the building and the purpose for which it is used very largely influence the illuminating engineer in his selection of one of these three methods. No one system of lighting can be said to be best for all purposes. Each case must be considered individually, for no fixed amount of light will give the same effect in all places.

The first method—viz., direct lighting, applies to the common run of burners and lamps when either unscreened or, as should generally be the case in indoor lighting practice, when fitted with globes, shades, or reflectors for promoting respectively general diffusion, screening in specific directions, and intensification of light output in the lower hemisphere, the side which are placed powerful reflectors either of highly-polished metal or of mirrored glass; and these latter are designed to throw practically the whole of the light flux in an upward direction, either on to another reflector above the bowl, or, as is more generally the case, on to a white ceiling, whence the incident light rays are scattered downwards into the room—*i.e.*, diffusely reflected in a perfect manner which ensures remarkably uniform illumination and complete absence of "glare" and shadows.

Here, then, we have the reverse condition to that obtaining in the case of direct lighting systems. No rays are transmitted directly to objects on the working planes; but they are illuminated indirectly—*i.e.*, through the agency of diffuse reflection. To be successful in practice, the indirect method of lighting calls for clean white ceilings and lightly decorated walls;



Holophane Semi-Indirect, No. 010.



- - - - Burner alone. ——Burner with Bowl Photometric Curve.

Fig. 158.—Holophane Semi-Indirect Bowl equipped with Standard Universal Inverted Gas Burner and Inner Chimney.

objects in a room being partly* illuminated by direct rays of light from the source and its diffusing auxiliary, &c. Hence the term "direct" lighting.

The second method—viz., indirect lighting, is dissimilar to the method we have just considered. Careful provision is made to prevent any direct rays from the source reaching the working planes† —viz., those which are two or three feet above the level of the floor, at which height one would work or read. Objects are illuminated entirely by the reflected light which they receive from secondary light sources of very low surface brightness—ceilings and walls. In indirect lighting systems the source is completely concealed from view, and all transmission is prevented by the employment of opaque bowls—usually of ornamental design and decorative finish—inand the lighting fittings themselves must possess efficient internal reflectors, which are easily removable for cleaning purposes.

[The co-efficients of reflection of mirrored-glass and a newly white distempered ceiling in good condition are, respectively, 80-85 p.ct. and 70-75 p.ct.]

Indirect lighting systems, such as we have just alluded to, are, of course, much less efficient than direct systems; and the former invariably give very flat results which cannot be considered the ideal for visual comfort. In order to produce contrasts in moderation, it is sometimes desirable to mount indirect units expressly with the object of illuminating the ceiling in areas of varying brightness; and this can be best accomplished by employing a few relatively large fittings, instead of a larger number of smaller ones.

As a compromise between direct and indirect lighting systems we have a third and excellent method of utilizing light sources—viz., the semi-indirect method, which gives, in its right places of employment, very pleasing results, the softness and uniformity, but not the excessive flatness, of the less efficient indirect method. Semi-indirect lighting systems have an average efficiency of utilization of the order of 50 p.ct. (assuming there are white ceilings and light walls), as compared, under like surroundings, with values of the order of 70 p.ct. and 35 p.ct., which obtain respectively with direct units of the extensive reflector type and indirect systems.

[This point of efficiency of utilization will be touched upon more fully a little later on in this article.*]

In semi-indirect systems—a typical example of which is shown in fig. 159—translucent bowls of opal or frosted glass,

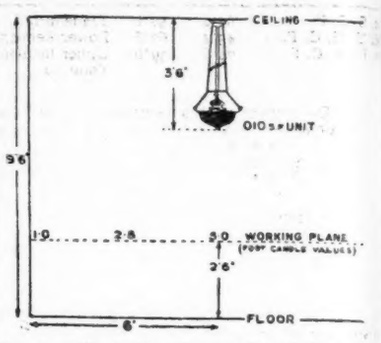


Fig. 159.—Illustrating the meaning of the working-plane and showing the foot-candle values given by a Holophane Semi-Indirect Bowl equipped with Universal Incandescent Burner and Inner Chimney.

N.B.—The unit of illumination is the foot-candle. The foot-candle is the illumination produced by a light-flux of one lumen uniformly distributed over an area of 1 sq. ft.

"Vitreosil," alabaster, Holophane clear prismatic glass, "Supastone," &c., are employed partly to enclose the source, so that the lower hemispherical flux of light is intercepted by the bowl—some of it being transmitted through the bowl as direct light, and some of it being reflected upwards to augment the upper hemispherical flux which, falling upon the ceiling or top

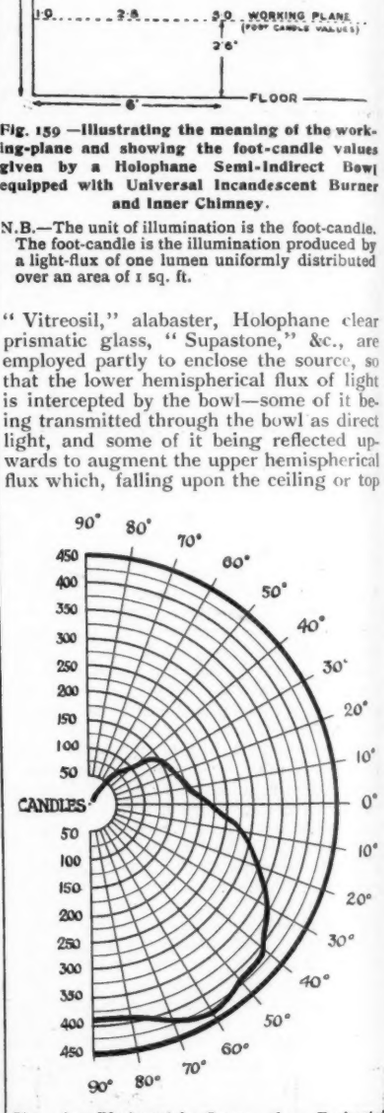


Fig. 160.—Photometric Curve of a Preheated Cluster of five No. 2 Mantles (unscreened), showing the distribution of light in the two hemispheres. Notice the extent to which the distribution in the lower hemisphere outweighs that in the upper hemisphere.

reflector and walls, is diffusely reflected. In this system no rays of light from the bare source are permitted to enter the eye directly. If the natural distribution of a source is such that it sends a large part of its total flux into the lower hemisphere, as is the case with inverted mantles, and in particular with preheated clusters (see fig. 160), the inside surfaces of these hemi-

* The qualification "partly" is necessary in view of the fact that reflection from walls and ceilings, &c., assists—sometimes very considerably—in the illumination of objects.

† We mean by the working-plane any horizontal plane—say two to three feet above the floor-level—along which it is convenient to measure intensities of illumination. In Germany, the standard practice is to measure indoor and outdoor illumination in a horizontal plane one metre above the floor or ground. In this country there appears to be no standard as regards the selection of the test plane; but for indoor work 2 ft. 6 in. is a useful height, and for outdoor work a plane 3 ft. above ground-level is frequently taken. Fig. 159 illustrates the meaning of "working plane."

* N.B.—The colour of the walls and brightness of the ceiling has, as will be seen later, a very decided bearing upon the value of the efficiency of utilization.

Data in Connection with Photometric Curve, Fig. 158.

Candle Power.			Quantity of Light Flux in Lumens.					
Designation.	Mantle.	Mantle with Holophane.	Designation.	Polar Angle Degrees.	Mantle.		Mantle with Holophane.	
					Lumens.	P.Ct.	Lumens.	P.Ct.
M. S. C. P. . .	60·0	50·8	Transmitted. . .	0- 60	243·3	32·3	137·5	18·3
M. U. H. C. P. .	45·4	62·6	Lower hemisphere.	0- 90	468·8	62·3	244·5	32·5
M. L. H. C. P. .	74·8	39·0	Upper hemisphere.	90-180	284·4	37·7	392·5	52·1
			Total flux . . .	0-180	753 2	100·0	637·0	84·6

N.B.—Flux of light is measured in lumens, and is equal to the intensity of the illumination multiplied by the area over which it is distributed. Spherical flux or total lumens = M.S.C.P. × 4π. Hemispherical flux = M.H.S.C.P. × 2π. The lumen represents the quantity of light falling upon one square foot of the surface of a sphere of one foot radius from a light source of one candle intensity, placed at the centre of the sphere.

spherical open top bowls should be capable of reflecting a good proportion of the normal lower-hemispherical flux into the upper hemisphere, and of transmitting about 20 p.ct. of the total luminous output of the unscreened source, within the effective zone of 0-60 polar angle degrees. Thus we see that with a semi-indirect fitting a part of the total flux is transmitted downwards through the bowl, a part escapes laterally, and a part is sent upwards on to a reflecting surface, there to be diffusely reflected. With this system, clean white ceilings and lightly-tinted walls are essential, because, as already intimated, the useful flux in the working-plane is made up of two parts—viz., that arriving directly from the lighting unit, and that which comes upon the plane indirectly after one or more reflections from the walls, ceilings, or other objects. The extent of the latter part depends upon the reflecting properties of the surroundings, such as colour, glaze, &c.—a matter which will be referred to in greater detail shortly. The complete photometric curve of a scientifically designed semi-indirect gas lighting unit is given in fig. 158. The relevant data are given above, and fig. 159 shows the foot-candle values of illumination produced by this unit when mounted, as shown in the drawing, in a small room having a white ceiling and light green walls.

The complete lower-hemispherical flux (polar angle degrees 0-90) and the effective flux transmitted through the bowl (polar angle degrees 0-60) naturally vary with the material used and also with the size and shape of the bowl and the location of the source therein. In the case of prismatic glass hemispheres, the proportions of the total flux respectively directed upwards and transmitted downwards can be controlled to a nicety; and the more pronounced the superficial glaze on the inside of bowls of other material, the greater will be the proportion of light sent into the upper hemisphere. It is interesting to compare the shape of the photometric curve given in fig. 158 with that of a well-known semi-indirect lighting fitting illustrated in fig. 68 (" SALESMAN " for Dec. 26, 1923)—the photometric curve (hemispherical) being shown in fig. 69. This unit consists of a cluster of four No. 2 preheated mantles with hemispherical bowl of opal glass and top mounted enamelled iron reflector forming the secondary source in place of the ceiling—the latter course generally being adopted

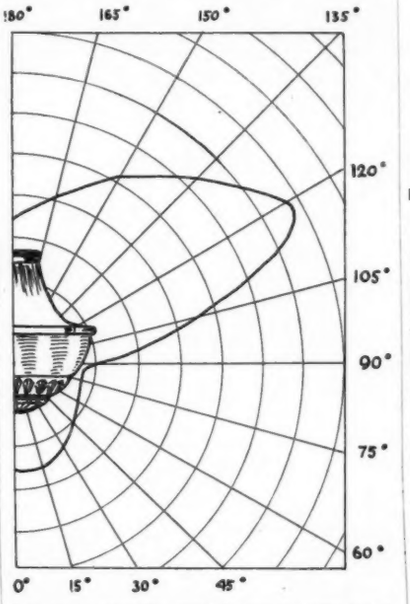
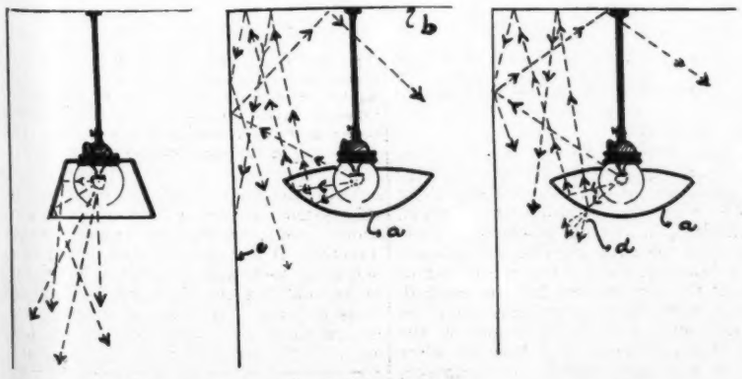


Fig. 161.—Showing special form of light distribution from a totally-enclosed Holophane "Filterlite."

in the case of both " indirect " and "semi-indirect " units when the ceilings are either too dark or too far removed from the sources to serve as efficient reflecting surfaces. Semi-indirect bowls can be obtained in varying sizes and degrees of opacity to give gradations of intrinsic brilliancy; and their employment gives one control over the formation of shadows not only of the fittings themselves, but



Direct. Indirect. Semi-indirect.

Fig. 163-5.—Diagrammatic representation of Lighting Systems.

Fig. 162 (a).—Totally-Enclosed Gas Lighting Unit (Sugg's "Unique" Lamp).

also of the objects they illuminate. Care should be exercised in the important matter of the location of the source in the bowl. With units of the type shown in fig. 68, Messrs. Sugg & Co. advise that the mantle lugs should be level with the edge of the bowl; and the Holophane Company's standard position in respect of their bowl shown in fig. 158 is $\frac{3}{4}$ in. from the top of the glassware to the centre of the mantle.

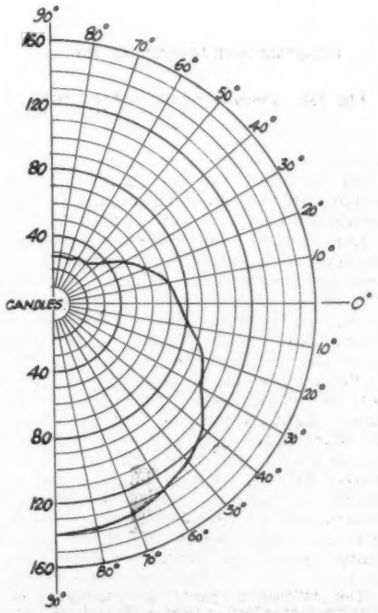


Fig. 162 (b).—Photometric Curve of Sugg's "Unique" Lamp—3-burner size.

Another design of lighting unit belonging to the semi-indirect class is the totally-enclosed luminous bowl. This arrangement prevents the accumulation of dust inside the bowl, and diffuses the upward rays so that the sharply-defined bright patch of light on the ceiling immediately above the fitting—a condition usually met with in semi-indirect installations which

rely upon the ceiling as the secondary source—is avoided. Most excellent results have been obtained with the "Holophane Filterlite"—a specially-designed semi-indirect lighting unit of the totally enclosed type—utilizing electric sources; a very wide distribution of light being given in the upper hemisphere. The data furnished by the manufacturers show that 75 p.ct. of the available light is directed toward the ceiling and 25 p.ct. sent downwards. The photometric curve is of the form reproduced in fig. 161, showing half the bowl. A totally-enclosed gas lighting unit that has recently made its appearance is featured in fig. 162, by the side of which is given its light distribution curve. The source is a 3-light cluster of No. 2 preheated mantles, and the bowl is made of opal, and is in two pieces. The diffusion of light is very good, and the bowl as a whole presents a mellow surface of uniform brightness; but the character of the photometric curve at once indicates that it is not the purpose of this particular unit to make much use of top reflection from ceilings, as is the case with the unit shown in fig. 161, because the curve is relatively weak in the upper hemisphere. However, the fitting is a most useful one for a variety of purposes, and forms a valuable addition to the many excellent gas lamps now available.

Since the foregoing lines were written, the author has noticed an apt allusion to the three methods of interior lighting in a B.C.G.A. publication entitled "Gas: Notes for Teachers." The case for each method of lighting has been well summarized in the following excerpts which are illustrated by three annotated diagrams reproduced in figs. 163, 164, and 165.

> Fig. 163 shows the direct system. In this case much of the light reaches the working area direct; but the more horizontal rays which are so troublesome to the eyes are redirected downwards at angles at which they are not only harmless, but also more effective.
>
> The indirect method consists in placing the lights out of sight, behind mouldings, cornices, and ornamental screens; and allowing the light rays to fall upon ceilings and walls to illumine the interior by reflection. In this way a softly-diffused light is obtained; but the method is somewhat expensive, because so much of the light is absorbed by the reflecting surfaces, even though they may be of a light colour.
>
> Fig. 164 shows the indirect system in which an incandescent mantle is arranged inside an opaque bowl (*a*) provided with a reflecting surface on the inside. Only half the bowl is shown in the diagram. The bowl, being opaque, allows no light to pass through, but reflects it upwards to the ceiling (*b*) and walls (*c*), as shown by the arrows. The ceiling and walls then re-direct the light downwards to the working parts of the interior. The course of some of the light rays can be traced by the respective arrow-heads in the diagram.
>
> The semi-indirect method makes use of visible sources of light, completely shaded by translucent bowls through which the light is filtered and diffused. It is also reflected that the ceilings and walls or the special reflectors placed above the bowls. This method minimizes the risk of glare and heavy shadows, and can be made æsthetically very pleasing.
>
> Fig. 165 shows the semi-indirect system in which the bowl is not opaque, but translucent. The result is that some of the light from the mantle passes through the bowl directly to the working area below, while some is reflected back to the walls and ceiling in the manner shown by the arrows, and is ultimately directed to the lower part of the room. The light that passes through the bowl is scattered as a divergent ray as shown at (*d*), which effect constitutes one form of diffusion. The direct method is the most common way of lighting a room; and this, provided that the lights are so placed and shaded as to cause neither glare nor undue shadows, is a very satisfactory system of illumination—and the cheapest.

(To be continued.)

Wireless Pipe Locator.

Simple and Speedy Method of Locating Service Pipes, &c.

On April 10, when the London and Southern District Junior Gas Association visited the works and district stores of the North Middlesex Gas Company, a demonstration was given of a wireless pipe locator—a handy instrument which attracted a good deal of attention.

Suppose you have a main or a service pipe, or piping in walls, under the floor, or in the ground, and you do not know the path of the pipe, but wish to determine it exactly, you would connect the extreme ends of the pipe to a make-and-break coil (what the makers of the wireless locator term a "sending coil"). This closes an electrical circuit, and electricity flows along the pipe, no matter where the latter goes or how it twists and turns. Then you take ear receivers and a coil. Sounds like the buzzing of a bee are heard. These sounds come from the pipe; and though you may be a considerable distance from the pipe, they can be heard plainly. The buzzing ceases or changes when the coil is over the pipe. Thus it is simple to trace accurately the path of a pipe under pavements or concrete, or in walls; and after a little practice has been gained, the method is speedy. Pipes laid years ago, and which were 20 ft. below ground, have been located by this instrument.

An important feature about this method is that it is cheap. The current is supplied by an accumulator or four common dry cells. If the latter are used, their renewal is only necessary about once a year; while if an accumulator is employed, it has merely to be re-charged at intervals. As to the skill required for the use of the instrument, anyone can operate it after a few trials, no technical or electrical knowledge being needed. The weight of the complete apparatus is only 20 lbs.

In the "Yorkshire Telegraph and Star" for April 30, the following appeared: Some time ago two men met. "Coil's a rare price," said Jack. "It is that," said Bill, "and mucky an' all." "As't ever thowt of a gas fire?" asked Jack. "No." "Way, thee try it and see." A month later the two men met again. "Did ter ever try t'gas fire idee?" asked Jack. "I did that," said Bill, "and it's 'orl reet. T' chap whot fixed it three weeks ago lit it, and it's nivver been aht since."

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